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ABSTRACT

Manuscripts of 99 speeches are compiled in book form for general, subject area, and special interest sessions of the convention. Speeches in the subject area and special interest sessions addressed one of the following major topics: (1) Curriculum Development, (2) Inner-City Schools, (3) Instructional Systems, (4) Teacher Education, (5) Vocational Education, (6) Information Science, (7) Space Technology, (8) Elementary Schools, (9) Special Education, (10) Computer Technology, (11) Communications, (12) Dropouts, (13) Student Clubs, (14) Industrial Arts College Clubs (IACC), (15) Supervision, (16) Crafts, (17) Drafting, (18) Electricity/Electronics, (19) Graphic Arts, (20) Plastics, (21) Power Technology, (22) Woods, (23) Other Action, and (24) Business of the Association. A chronological index and a comprehensive subject-and-author index are included. (CH)

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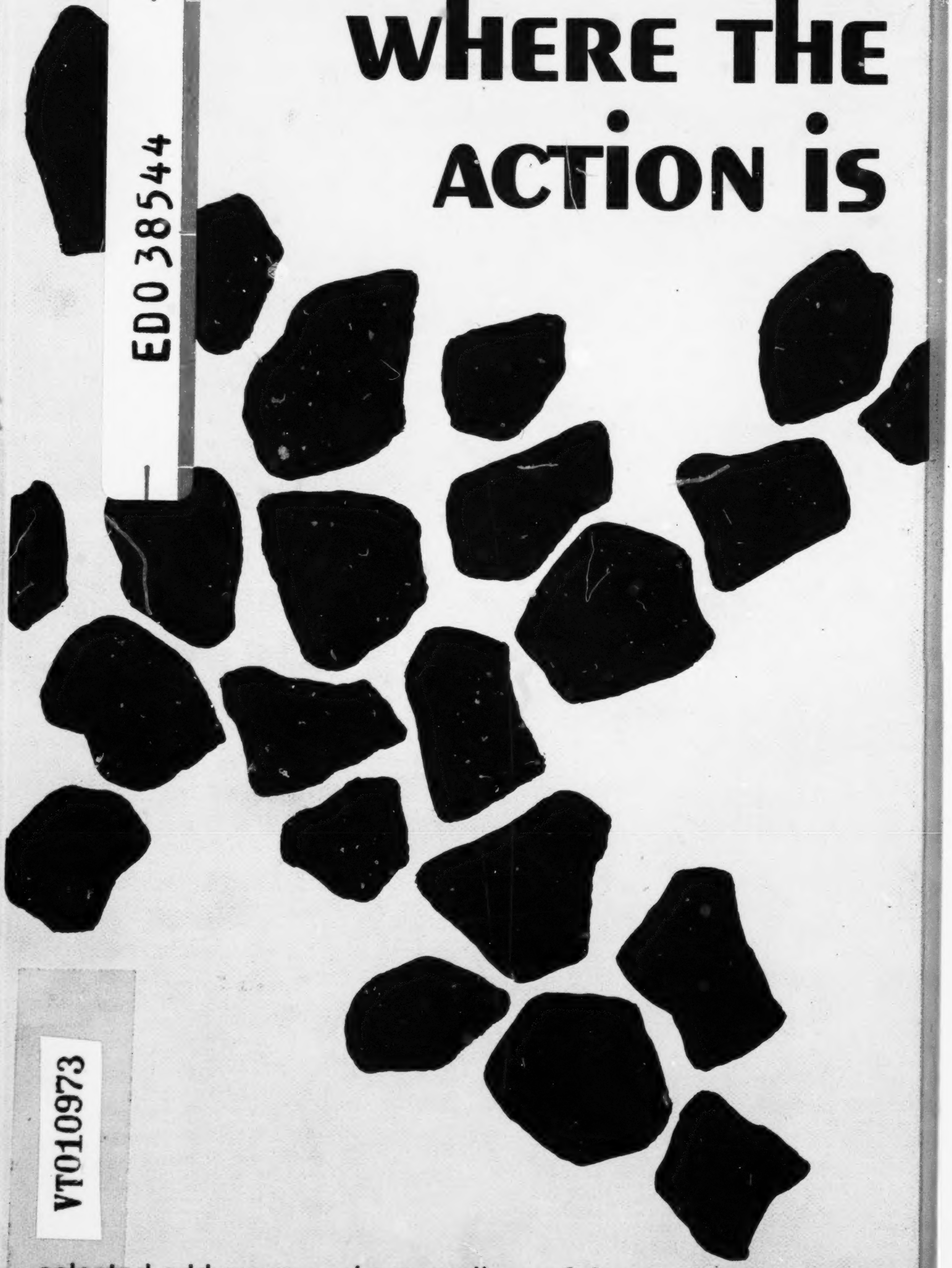

selected addresses and proceedings of the american industrial arts association's 31st annual convention at las vegas

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aiaa general session addresses

Education in the future—no optimism, but some hope

Neil V. Sullivan

The year 1969 is one-fourth gone, and the crisis in education deepens.

The nation, including some educators, is well aware that the public schools are failing properly to prepare millions of young people – particularly minority students – for life generally, careers and jobs in business or industry, or for entrance as students into institutions of higher learning.

The people of this great democracy are waiting – but no longer patiently – for the educational establishment to begin immediately to put our house in order and develop a system that will make it possible for all students to achieve some measure of success upon completion of their training.

I wish that I could say to you that I am optimistic about the establishment's ability to take the action necessary to avoid disaster. Although not optimistic, I am hopeful. Hopeful because there are some encouraging signs on the horizon. Not many – but some.

One of the signs I found personally encouraging was the willingness of the Massachusetts Board of Education to name an educational innovator – an avowed integrationist – as their new Commissioner of Education, the fourteenth successor to Horace Mann (Massachusetts' first Commissioner of Education).

Another equally pleasing sign was the action taken by the Berkeley Board of Education in naming the imaginative, creative Richard Foster as their new school superintendent.

These two actions are examples of what I hope will be a trend in public education in the United States.

Too many of our leaders have been dedicated to one major ambition and goal – namely, to retain the status quo. That is one of the main reasons why today's world is in crisis and education is in the doldrums. Many educators have constantly protected procedures which were successful in 1900. They have never opened their eyes, or their minds, to a new vibrant society growing up around them.

Yes, growing up despite them, but in such a sick way that millions have been relegated to second-class citizenship because of the kind of schooling these old-time educators so righteously, but so stupidly, defended.

All of this must change – and NOW – if public education is to continue.

Let's zero in on our schools and see just how well they have been doing.

Standardized tests for entrance into the Armed Services present but one of many evidences of the shocking fact that an enormous proportion of minority high school graduates – the overwhelming majority in some states – is "functionally illiterate". In other words, even though schools have "taught" students for 12 years, they have failed to teach them to read.

This is indeed a national scandal. The scandal is compounded by the many instances in which this failure is accepted as either right or unavoidable. It is, of course, neither. Minority youngsters, like their Caucasian counterparts, will learn successfully – when they are taught successfully.

The fact that schools simply cannot continue to fail so grossly with such a large proportion of students raises several issues:

(1) How can teacher attitudes toward students be altered so that each student will be viewed with an advance expectancy of success?

(2) How can schools fulfill their responsibilities in developing student motivation?

(3) How can our schools be remolded – in structure and in curriculum – to promote both the academic and the attitudinal education of all students and prepare them for life in a multi-ethnic society?

Note that the first word in each of these issues is "How," not "If." These problems must be solved, and time is running out!

A generation or two ago – when there was a greater demand for unskilled labor – the schools could bury their failures in the labor market. This is no longer true. There is an ever-shrinking demand for that kind of work. Within the next several years, 24,000,000 unskilled and semi-skilled jobs will have vanished.

Furthermore, modern society is growing so complex that people require greater education simply to function as citizens. In other words, schools simply can no longer fail and hide that failure.

The consequences of continued failure could well be the destruction of society itself, as millions of our citizens refuse to accept the role to which they are consigned in society by failure in school. Instead of accepting the traditional failure, our citizens are demanding that we educate all children rather than just those from middle-class and privileged backgrounds.

This is a big order but one which must be met if our schools are to do their part in preparing students of all ethnic backgrounds for college and for effective participation as citizens in a multi-racial society.

What is needed for success? Let's refer to the three issues which I posed earlier: Teacher attitudes must change. There is a growing body of evidence that the single factor of teacher expectancy can itself stimulate success. Last year a research study was conducted at the Oak School in South San Francisco by Robert Rosenthal of Harvard University and Lenore Jacobson of the South San Francisco Unified School District.

The teachers in Oak School were told that about 20% of the children in each of the school's 18 classrooms showed unusual potential for intellectual achievement based upon a new test called the "Harvard Test of Inflected Acquisition".

These "unusual children" had actually been selected at random. Eight months later, lo and behold!, the experimental group had made significantly higher gains than had the other students in the classes.

Teacher expectation was the key here, and it was built upon the premise that a randomly selected group of students showed an unusual potential for intellectual achievement.

Each of you could cite instances in which students performed according to the teacher's expectation. It is common knowledge that teachers all too frequently form advance judgments about students on irrelevant criteria – then educate them accordingly!

And who is it that suffers from low teacher expectations? Certainly not the well-groomed, well-clothed, polite, white, blue-eyed Anglo-Saxon child from a middle- or upper-class home.

Rather, the black children in our society have been deemed innately inferior and, therefore, not capable of real educational achievement.

Our brain-washed teachers, educated in a racist society, brought up in racist homes, have been led to believe that they should not expect too much from their black children.

In fact, in many quarters it was thought "cruel" to try to stimulate black boys and girls to a level of learning that was supposedly over their heads.

Even worse, in some sections of our country, our children have been deliberately under-educated as a matter of policy. Blacks were to be kept in an inferior position in the work world and in society in general. Therefore, their educational opportunities were deliberately scuttled.

These conditions must change immediately. The immorality of the policies and practices which consign certain children to the educational scrap heap must be exposed and condemned.

Our teachers must recognize the right of all children to the a priori assumption that they can be educated; and they must educate all children to their full potential.

I was intrigued recently to read about a contract between the Job Corps and one of its contracting private firms, the Thiokol Chemical Corporation. This contract stipulated that part of the payment to the firm be based upon its success with the Job Corpsmen.

For example, a certain amount was to be paid for each student who qualified for a high school diploma. An additional amount was to be paid for each Corpsman who was gainfully employed within a certain period after his experience with the Corps. There were other small stipulations.

In short, the contract gave the company involved a financial stake in the success of the students.

I wonder what would happen if we applied that same approach to the teachers and administrators of our schools today? It might make us more reluctant to accept the failure of any student as "inevitable."

Schools must take responsibility for the motivation of students. Too often we hear this excuse for student failure – he simply lacked motivation and was not trying.

We recognize that the student has little chance for success in school without motivation, but we cannot simply fold our hands and shrug that knowledge off. We must realize that motivation, although an inner force, can be stimulated from without.

In many of our middle-class homes motivation for success has been built in from the very beginning. We applaud when the baby utters his first syllable or takes his first halting step. We shower our children with fringe benefits when they behave properly or when they get good grades in school.

We let them know what kind of success is expected, and we reward them both tangibly and with subtle forms of recognition when they achieve it. Our own drives for success are passed on to our children. We make sure that the incentive is always there.

However, this is not true with masses of our minority children in inner cities. Many homes do not provide the stimuli necessary to motivate children for success in school. There are many reasons for this – lack of material possessions, the lack of background in what constitutes academic success.

I'm sure it is not lack of wanting what's best for the children, or lack of love. Rather it is the lack of the means to provide the same reward stimulus found in many middle-class homes.

Up to now, our schools have largely abdicated their responsibilities in this area. Since middle-class children brought to school clearly-defined motivation for academic success, they succeeded. The school felt no responsibility for those students who did not bring that motivation with them. I say this is wrong.

Schools cannot use "lack of motivation" as an excuse for their failure to educate children. We must overcome this obstacle, not use it as an alibi.

This will call for a reassessment of the basic approach used toward students. It means we will have to learn more about the "science of behavior" and the role which built-in incentives can play in motivating students to learn.

Valuable research is being done in this field by such organizations as the Behavioral Research Laboratories in Palo Alto. The results of such research can be used by schools to build in incentives which are not provided by homes or by the community.

Of course we are not going to depend solely on outward rewards or "incentives" to motivate students to succeed in school.

The students must feel inwardly motivated to learn because of the intrinsic value in the job of learning itself. Before this can be accomplished, however, the students will have to recognize the relevance of what they are asked to learn.

Schools then have a two-pronged assignment – to supply the external incentive for success in school; and to promote personal motivation to learn by making the material relevant and the learning process itself a source of pleasure and satisfaction.

Schools must be re-organized – both outwardly and inwardly. Outwardly our organization needs to be altered to promote racial balance in the schools. I do not propose to enter into an extensive discussion of the school segregation issue at this time, but I do feel strongly that an integrated setting is needed if our schools are to be relevant in the year 1969.

This is a multi-racial nation; it is a nation in which each ethnic group has major contributions to make to its own members and to members of other groups.

The future of the nation rests on how well these diverse groups relate to each other. We must help each child build feelings of genuine respect both for his own group and for all others in our society. This cannot be done if racial groups are kept apart during their important school years.

I am willing to concede that academic achievement can take place in racially imbalanced settings – provided we are willing to spend the money necessary to achieve it. But the attitudes necessary for a multi-racial democratic society cannot be achieved in that kind of a setting. This we must know after 300 years' experience with separation.

Although we are struggling to achieve racial integration, we cannot wait until that goal is achieved to come to grips with our failure to educate millions of minority children.

Sweeping curriculum changes are needed now. The content of curriculum must be made relevant to the needs of today's students now. Our methods of teaching, too, must be drastically altered.

It is not my purpose here to deprecate the contribution to American folklore of the "dedicated school marm" who carried the sole responsibility for all of the education of her 25 or 30 youngsters.

However, the "Miss Dove" syndrome is clearly out of place in a school program geared to recognizing individual differences and in stimulating each youngster to progress at his own maximum pace.

What is needed is a greater role for the kind of programmed learning developed by Dr. M. W. Sullivan of the Behavioral Research Laboratories. I might add that the Sullivan program has been successfully introduced into Dr. Rhody McCoy's Ocean Hill-Brownsville District in New York City.

I want to go on record as strongly endorsing this type of individualized instruction. Far from undercutting the role of the teacher, it makes the teacher much more effective in dealing with the widely diverse needs of the youngsters in her charge.

Frequently we hear the teaching establishment insist on more money for higher salaries and smaller classes. This is a fine hope except for one thing – the current sources of money have just about dried up.

The major cause for the dry-up is the high priority our country has placed on financing a war machine and the low priority the Federal government has placed on educating the nation's youth.

A total of 79 cents of each income tax dollar goes or is spent for defense purposes. Only one cent of the tax dollar is spent on education and welfare.

Until this nation establishes new and realistic goals for education, until we concentrate as a people on peace and not war, until we take the onus for the support of public education off the local property tax, we must operate our schools with new approaches but with about the same amount of money we now have.

If this means fewer high-paid administrators, so be it.

If this means a teaching role for many of our so-called "special teachers and supervisors", so be it.

If this means fewer classroom teachers deployed in a different fashion, so be it.

If this means that some of our master teachers receive salaries comparable to some of our administrators, so be it.

If this means reducing teaching staff and adding para-professionals, so be it.

If this means we turn some of our programs, e.g., vocational education, over to private industry and concentrate on the humanities, so be it.

If this means we build large, educationally challenging and economically realistic new plants and end the day of the small neighborhood school, so be it.

If this means that we narrow the number of electives for some students in order to provide early childhood education for all children, so be it.

If this means keeping our schools open 12 months a year and asking those professionals in our schools to take a one-month vacation rather than three, so be it.

If this means having the young people in our schools decide on what in the curriculum is relevant and eliminate the irrelevant, so be it.

If this means a "take over" of our schools by parents because of the procrastination and vacillation of some board of education, so be it.

I am prepared to recommend that this nation take whatever steps are necessary in order to provide equal educational opportunities immediately for all of the nation's children.

I see the use of para-professionals as a powerful boost for the school in improving the performance of students.

We want the students to feel inwardly motivated to learn because of the intrinsic value and the job of the learning itself. Before this can be accomplished, however, students will need to be able to recognize the relevance of what they are asked to learn.

The list of changes could go on and on. However, this brief discussion is sufficient to show that our schools must be reorganized if they are to accomplish their purpose.

I'd like to tell you the story of a poor Irish boy whose mother was so determined that he receive the kind of education needed to get ahead in this society that she maneuvered him out of a ghetto school and into a middle-class school within walking distance of the ghetto in which they lived.

There he was exposed to middle-class children. He found this exposure challenging in certain ways, and found his own self-image improved by the discovery that he could do some things better than they could.

He found that his attitude changed as conditions around him changed. He developed the skills of getting along with people across ethnic lines.

How come that poor Irishman – who was Superintendent of Schools in Berkeley and is now Commissioner of Education of Massachusetts – could achieve a measure of success when millions of minority children who have the same at-birth intelligence and achievement potential are failing in such large numbers?

I am convinced it is because of my mother's encouragement and the attitude of my teachers. They were convinced that because I was white, despite my immigrant background, I could learn. They expected me to learn; they insisted that I learn. I therefore learned.

Our students will learn only if: 1) their teachers expect them to learn; 2) the schools fulfill their responsibility to develop motivation; and 3) the schools are reorganized to promote the academic and attitudinal education of all students.

Our schools must expect that all students can learn. We must recognize that failure of a child in school is failure of the school with the child. Schools are only as successful as their students. Yes indeed, neither you nor I can be optimistic, but there is still some hope.

Dr. Sullivan has just begun work in his new post as Massachusetts' Commissioner of Education with offices in Boston.

1990 AD and Man's flight to the planets

Krafft A. Ehricke

The national space effort, of which exploration of the solar system is an integral part, advances much more than knowledge of earth, the solar system and the universe. It advances a broad range of technologies and human skills. It is a nutrient that fertilizes and enriches virtually every human activity, from industry, health and resources to social progress. It provides us with a growing freedom of operation in space as well as on earth, through such associated technologies as cybernetics and navigation and communication satellites. This freedom is important to our national security. It contributes concretely to the economy of our defense and provides knowledge that allows more finely-tuned diplomatic interfaces with other powerful nations. Beyond national prestige, space operations can be a cause of national inspiration in an era of cynicism, and can be a source of good will among men.

In short, a steady national space effort constitutes a nationally valuable concentration of energy at a time when a great variety of situations invites much scattering of national strength. Exploring space is a constructive application of modern man's great technological knowledge and power.

Along with all the other segments of the national space program, the exploration of the solar system has many immediate, important scientific objectives and practical benefits. But in an undertaking of such enormous scope, we must adopt a longer view of its meaning. To 16th-century Europe, America's immediate return was gold. Its long-range return, however, was much greater. America contributed a new dimension to human civilization. Today the time between immediate return and long-range promise is measured not in centuries but in decades. Therefore, the long-range promise must be recognized. The profound significance of solar system exploration must be gauged in the context of a greater central objective.

This central objective is the acquisition of the solar system as a source of knowledge, technological advancement, raw materials, resources and for the cultivation of existing or new biological resources wherever feasible and practical.

Why look for resources beyond earth? Our earth must be protected and preserved as the natural home of humanity, because its oceans, atmosphere and living mantle are unparalleled in the solar system. Terrestrial resources are limited. Exploitation of these resources is restrained by the need to preserve the balance of nature, the ecosystem. This ecosystem, the product of two billion years of organic evolution, has generated an environment which must remain essentially as it is if we want to continue exploiting its resources and still maintain a firm base for the future of terrestrial mankind. Only the progressive use of the vast and virtually inexhaustible resources of the solar system can make this possible.

Earth, a large space ship, travels in a convoy. Where and when practical, we will board, occupy and utilize our companion space ships. Since the other bodies in the solar system are not unique in the same sense as is earth, they are expendable and transform-able. On many other worlds we are not subject to the restraints of preserving and enlarging a vital ecosphere. With nuclear charges, we can tear an asteroid apart and gain access to valuable minerals at its core. We can conduct nuclear mining on Mercury rather freely. In space, and on other worlds, once the absence of native life is established, we need not worry about contamination, spoilage, waste or refuse for a long, long time to come. Other planets, such as Mars and perhaps Venus, are potential incubators of life. By fertilizing these worlds, we may become builders of new ecospheres. The scope, grandeur and promise of this challenge will not be overlooked by nations which history will recognize as the pioneers of our era.

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*A great portion of this material is taken from a book, scheduled to appear in May, 1969: Exploring the Planets, by Krafft A. Ehricke and Betty A. Miller, published by Silver-Burdett, a Division of General Learning Corp., Morristown, New Jersey. Printed with the permission of Silver-Burdett.

Space capability, and the sum total of all the associated skills and capabilities emerging from it, provides an indispensible basis for future options on behalf of peace and survival for all mankind. Knowledge of and access to the solar system is more than a matter of curiosity; our very future hinges on it.

Mercury is a small planet whose moon-like surface is slightly larger than Africa and the Americas combined. Its interior is probably rigid and cold. The surface is solid and rocky. Intense thermal shocks between day and night temperatures and the massive impact of cosmic debris during the early period of the solar system probably created huge cracks and fissures.

Violent solar plasma storms must have caused a breakdown of major surface features. Erosion of craters and mountains probably produced a rough, crackeled surface, covered with boulders, rubble and dust. Daylight bathes the countryside with the brilliance of a fully-lit TV studio. Venus and earth periodically reach great brilliance in Mercury's sky, illuminating the landscape at night. When a particularly intense solar flare hits, the ground in shaded areas may emit a faint glow resulting from interaction between high-energy solar protons and atoms on the surface. Mercury is in the "cleanest" region of the solar system, as far as meteoritic dust is concerned. Micrometeoroid impacts are not likely to be a great worry for visitors.

The high density of Mercury – the highest in the solar system with the possible exception of Pluto – suggests a greater abundance of heavy elements than on earth: chromium, iron, nickel, tungsten, etc. Mercury probably is also a good place to look for rare earths and mercury. Its potential future utility is therefore considerable.

Venus most closely resembles the earth in size, mass and surface gravity. But there the similarity ends. The results of the United States Mariner II, V and the Russian IV Venera have dramatically increased our factual knowledge of this planet's characteristics.

Dense cloud layers obscure the surface. From earth-bound radar measurements and from the radiometer measurements of Mariners II and V, it can be inferred that most of the Venusian surface is made up of mountains and deserts. Two major mountain ranges at least as large as the Rockies have been discovered by radar experiments. The Alpha range runs north-south for at least 2,400 miles; the Beta range runs east-west and is even longer. Ice may possibly be found at the poles or on top of high mountains.

The surface is extremely hot, dry and under atmospheric pressure so high as to cause strong refraction, that is, the bending of light rays. If sunlight penetrates to the surface (as it does at least in the equatorial regions, according to Venera IV), it would be visible during the Venusian night as an eerie glow between the zenith and the horizon. Standing on Venus, one would have the impression of being at the bottom of a gigantic, all-encompassing canyon, on whose "walls" are reflected distant objects and events.

Where sunlight does not penetrate, abyssmal blackness prevails, similar to that found in the depths of our oceans. A rainbow-like sheath of light would flicker in the immediate vicinity of active volcanos that, if visible from some distance, would seem to float in the sky. Because of its high density, the atmosphere is probably less turbulent than that of the earth. The temperature decreases with altitude, and it is quite cold above the cloud layer.

It is hard to envision the rise of life on Venus under presently known conditions. However, its existence cannot yet be ruled out with certainty. Abiogenic organic matter is probably present if the planet harbors no life.

Mars is very dry, by earth standards. The amount of open surface water and ice on the entire planet would barely fill the basin of one of the Great Lakes. If limonite abounds, water, hence oxygen and hydrogen, is potentially plentiful. If water is available, man could decompose it into oxygen for breathing and hydrogen for fuel. Aside from using mechanical means for extracting the water, it may be possible to introduce organic catalysts (enzymes) to liberate water on a large scale from limestone in the dust deserts, supporting not only manned bases, but even a Martian agriculture.

The interior of Mars is unknown. The pictures from Mariner IV provided no indication of recent volcanic activities. This apparent lack of geologic activity for a long period of its past could indicate that the Martian interior is cold and rigid. It could also mean that layers of permafrost, unbroken for ages because of the lack of geologic activity, have effectively sealed large deposits of liquid water underground. If so, these deposits could be tapped on the earth. However, more facts are needed for a definite conclusion.

Scientific interest in Mars centers on life and comparative planetology. To take the latter first, Mars is of interest because it resembles both earth and moon. In size Mars is comparable to Mercury, and in density it is comparable to moon. Mars is located at the inner border of the asteroid belt and must therefore have been bombarded for longer periods after its formation than was Mercury, and more violently than was moon. Mars will provide us with yet another "still picture" of planetary evolution, at a state different from that of Moon, Mercury, Venus and earth. Mars might be called a little earth in hibernation. Its metabolism, in terms of water, air and solar cycling power, resembles that of earth, except that it is slower and more feeble. Therefore, the currently planned search for extraterrestrial life concentrates on Mars.

However, conditions that tend to inhibit or prevent life are manifold. The dryness of Mars must have existed for geologically very long periods, judging by the age attributed to the observed crater formations. Mars receives only half as much solar energy per unit of surface area as does earth. Its atmosphere is rich in carbon dioxide, but, like that of Venus, it is strangely poor in nitrogen. Because of its greater distance from the sun, solar flares are more subdued on Mars than near the other terrestrial planets. But absence of a magnetic field leaves all of the atmosphere unshielded against solar particle radiation. Since there is virtually no oxygen in the Martian atmosphere, there are no layers of atomic oxygen and ozone.

The Martian surface is therefore exposed to solar ultraviolet radiation that is deadly to organic life. Life may, however, exist underground or may have developed organic protective devices against solar ultraviolet radiation, thus permitting existence on the open surface. Seasonal changes are more extreme than on earth, at least at the surface, because of the greater ellipticity of Mars' orbit. Low temperatures are bound to slow down the pulse and evolutionary tempo of life. However, the temperatures are not below the tolerance of organic life.

Beyond Mars, the distance between planets grows from a fraction to several astronomical units. The first of these gaps is filled with a large number of asteroids (small bodies of irregular shape) measuring from 480 miles to less than 1 mile in diameter. Collisions between members of the large asteriod population must be comparatively frequent, by cosmic time standards.

The primary objectives of asteroid exploration are: (1) More and better statistical data on the asteroid population as a whole; (2) study of the asteroids as individual celestial bodies; and (3) investigation of their material composition and structure. The origin of the asteroid belt and its relation to certain types of meteoroids bears importantly on the nature and history of the solar system. We may, in the not-too-distant future, try to "snatch" a tiny asteroid and bring it into earth orbit for detailed studies by scientists of many nations.

Aside from the scientific importance of exploring the asteroid belt, knowledge of the meteoroidal environment between Mars and Jupiter is important to mission planning and spacecraft for survival enroute to the Jovian planets.

Comets are objects of extremely small mass but are frequently enormous in size. At a great distance from the sun, roughly near Jupiter or beyond, the spectrum of an entire, tailless comet is that of sunlight reflected on solid bodies. As a comet approaches the sun, frozen gases begin to evaporate and the spectrum characteristic of gases begins to appear. As a comet passes close to the sun, a million miles or less, the spectrum changes to that of atomic iron, nickel, sodium, potassium and ionized calcium. Thus it is known that comets contain gases and metals.

The spectrum shows that most of the gases are free radicals, that is, compounds in which an atom of one kind binds fewer atoms of another kind than it could (less than its so-called valence). For example, a nitrogen atom can bind three hydrogen atoms, forming ammonia (NH_3). The compounds NH and NH_2 are therefore free radicals of ammonia. A carbon atom can bind four hydrogen atoms to form methane (CH_4). CH, therefore, is a free radical of methane. CN is a free radical of the poison dicyanide (NCCN) or of potassium cyanide (KCN). OH is a free radical of water (H_2O).

Free radicals are very intriguing substances. They are highly unstable under terrestrial conditions. They combine readily with other substances to attain their full valence value. The reactions are exothermal, that is, energy is released as in a combustion or an explosion. In space, however, these materials are isolated and are therefore preserved. They could be used as spacecraft fuel.

Unmanned probes are the first step in solar-system exploration and the source of engineering information for manned operations. The launch vehicles, upper stages and space propulsion modules needed to send unmanned probes to every planet and to many asteroids and comets are now available or well within the capability of today's technology.

In the 1970's and 1980's, spectacular successes can be gained by unmanned missions that take full advantage of present technological capabilities and exploit opportunities of the near future to close many knowledge gaps. These successes carry sizable returns in terms of scientific knowledge, historic firsts, national prestige and perhaps inspiration. The resulting environmental data and the attendant technological advances in instrumentation, navigation, information handling and long-duration spacecraft operations will contribute importantly to the definition and practicality of manned planetary missions.

Manned missions are the only way in which the occupation and utilization of selected portions of the solar system can be realized. But the advantages are expensive. Manned missions require large, advanced propulsion systems, life support systems and spacecraft capable of returning to earth. Heavier payloads and higher mission energies are involved. Thus, crew participation is truly worthwhile only for missions that are too complex for unmanned spacecraft. These missions emphasize active experimentation with on-the-spot evaluation and alternative actions in response to findings. Manned missions are required for the establishment of partially- or fully-automated research stations and, above all, missions that involve using mining or processing local resources.

Manned missions require a thorough analysis of their objectives and of the most efficient approach to meet these objectives. If warranted by the value of the extraterrestrial object, all activities, that is, exploration, occupation and utilization, will come into play. By comparing the value of unmanned and manned operations, it is possible to realize the broader and more long-range role of manned operations and to assess more realistically when active manned participation becomes worthwhile at various destinations. This assessment should be the controlling factor in deciding whether or not a planetary mission is to be manned.

There are three operational methods available to manned missions: Remote surveillance, deployment and control of probes, and manned landings. The first two can be employed in flyby and orbit. The third is based on an orbiting manned spacecraft. Thus, capture either is limited to orbiting or may involve landing. The first point of the subsequent discussion is a comparison of mission types. This comparison must include the time factor. Flyby of Venus or Mars is the earliest practicable mission group, beginning in the late 1970's. Mars or Venus orbiting missions could be planned for the early 1980's. Mars landing or Jupiter flyby missions are hardly feasible before the middle or late 1980's.

The spacecraft's destination payload is made up of remote surveillance equipment, probes and Landers. Remote surveillance is simpler from orbit than from flyby, because more time and fewer changing conditions are involved. The equipment required, such as sensors and data processors, is highly developed now and will be still further advanced when manned missions become feasible.

Whether to do a flyby mission in the 1970's or concentrate on a later, yet more worthwhile, capture mission is a very complex question. Capture clearly offers a superior, longer-range solution for Mars, Venus or Mercury missions. This does not mean that manned flyby missions are never worthwhile. A manned Jupiter flyby, for example, is almost certainly worthwhile, because of the abundance of observations and samplings that can be made regarding the planet, its environment and its far-flung satellite system. But in most cases manned flyby missions are not competitive with unmanned Orbiter or Lander missions. The more distant future offers possibly more justifications for flyby missions. Future bases in the solar system can be supplied from earth more economically by flyby than by orbiting, that is, by inserting only the supply cargo rather than the entire vehicle into orbit around the planet. Round-trip time for an orbiting mission is comparable to, or even shorter than that required for flyby. A crew size of from eight to 10 is required for either mission. The principal difference lies in the over-all velocity requirement and thus the orbital launch weight of the vehicle.

Landing missions are an extension of orbiting missions. The vehicle must go through the same flight pattern in both cases. However, for landing the minimum payload level is dictated by the manned Lander. Two Landers should be carried to provide back-up in case of an emergency which would otherwise leave the landing crew stranded. Furthermore, landing missions require two or three more crew members. These factors add up to a significantly higher payload. Thus the launch weight is higher, and it is more expensive to put the vehicle in an earth parking orbit. The mission velocity is the same, but Orbiter and Lander missions can be very different with regard to cost and mission operations.

Should an orbital mission include a landing? Not necessarily. There are, of course, several factors that make a landing mission attractive, where such a landing is possible. These factors include scientific interest, prestige and the inspirational effect of man landing on another planet.

On the other hand, if manned missions are long in coming, unmanned probes will have pre-empted the more basic scientific reasons for landing. The justification for a manned expedition will almost certainly determine whether the mission should include landing. Exploration alone, in the sense in which this term is used today, most likely will no longer be the only consideration, but will be replaced by samplings and experimentations. Landing operations necessarily involve many preparations just to explore a pinpoint on a planet's surface. On earth we make an effort to go into orbit because the advantages of global exploration from orbit are apparent to everyone. With 1980 remote-sensor technology, an entire planet can be explored rapidly and in great detail from orbit. Many unmanned Landers can be carried in place of one manned landing vehicle. The unmanned Landers would allow detailed examination of several ground locations. Such Landers would be under the control of the crew orbiting the planet. Sample retrievers can then be dispatched to the most interesting areas. Thus, a crew in orbit can conduct a level of planetary exploration that is comparable in detail to that of a landing mission, but more varied since several landing locations can be covered. This can be done with spacecraft payload weights that are less than or equal to those involved in a landing mission and at less risk to the crew. Thus, activities associated with the utilization of resources, with biological experimentations or special investigations will become the principal potential reasons for landing on Mars, Mercury, asteroids and satellites of outer planets. The effort which must be devoted to the development of a landing vehicle for an early Mars landing mission would slow the development of a truly adequate interplanetary vehicle. The strength of this argument depends on what is meant by a truly adequate vehicle. Basically, such a vehicle should not be limited just to Venus and Mars missions. Its range should extend from Mercury to Jupiter. It should have enough power to provide safe and reliable transportation.

The above discussion shows that transportation is the key problem of manned solar-system flight. Two important rocket propulsion characteristics are thrust and propellant consumption. The thrust should be high enough to provide a spacecraft acceleration of at least 0.0001 g. It would be better, however, to have an acceleration somewhere between 0.001 and 0.01 g. Propellant consumption depends, of course, on the thrust level.

Reduction of propellant consumption per pound of thrust produced is at least as significant in astronautics as an increase in mileage is to automobile driving. The amount of thrust in pounds obtained for each pound of fuel consumed in one second is called the specific impulse. With a good chemical propulsion system, a spacecraft can sustain a thrust force of, say, 10,000 pounds while consuming about 25 pounds of propellants per second. The specific impulse is therefore 10,000/25 = 400 seconds. The specific impulse is measured in seconds because the units of pounds cancel out in the equation. Reducing propellant consumption means increasing the specific impulse. An increase in the specific impulse is of crucial importance in space propulsion, because it means that a given mission requires less fuel. The initial weight of the spacecraft in orbit is reduced correspondingly. The amount of fuel required to place the spacecraft in an earth parking orbit is also reduced.

A chemical propulsion system is defined as one using a fuel and oxidizer as propellants, achieving up to about 450 seconds' specific impulse and being able to attain any desirable level of thrust acceleration. Nuclear propulsion is defined as a solid-core reactor, primarily the graphite reactor presently under development, using uranium-235 as fuel and hydrogen as propellant. Specific impulses up to about 850 seconds and thrust accelerations of 0.1 g or higher are attainable with a nuclear engine of 250,000 lb thrust, called NERVA II. Nuclear-electric propulsion produces specific impulses of between 6000 and 15,000 seconds. However, the attainable thrust is very low. The family of advanced nuclear propulsion systems includes three major types discussed below. All reach specific impulses in the thousands of seconds.

The combination of a high-thrust NERVA II-powered launch module and an electric space vehicle results in lower orbital launch weight than either the all-NERVA or the all-electric solution. This combination offers mission capability to the asteroids and Jupiter for essentially the same weight of about 2.2 million pounds. The longer transfer time allows the low thrust system time to reach the required velocities. Whether a nuclear-electric spacecraft is able to operate in the more debris-filled regions beyond Mars remains to be seen. Electric spacecraft are relatively sensitive to dust and micrometeoroids, because they have very large radiator areas necessary to pass the excess heat into space. For manned vehicles, these radiators have surface areas ranging from a fraction of an acre to over an acre.

For better alternatives we must look to more powerful and, above all, more rugged propulsion systems. These systems alone promise freedom of operation in the solar system. They would permit a greater safety margin, and increase the chances of success. Such systems will not be available until the mid-1980's to the 1990's.

By that time, the world will have become accustomed to the use of space and its benefits. Vast quantities of data will have been accumulated by unmanned probes. Much more will be known about the planets, the asteroids and the conditions in interplanetary space. As a result, new or different concepts will govern the means and purpose of manned missions. There will also be great advances in propulsion and power generation technology as well as in instrumentation, such as remote sensors, data processing, communication and microelectronics. Manned flights will no longer be based on exploration alone, but will include applications. Interplanetary vehicles will be required to reach beyond just Venus or Mars. Emphasis will be placed on short transfer times, as well as a healthy design margin for greater chances of success. Just barely getting there will no longer be satisfactory, because we will already have "gotten there" by means of unmanned probes.

Aside from nuclear-electric propulsion, three concepts of advanced nuclear propulsion systems offer a specific impulse in the thousands to tens of thousands seconds, and at a higher thrust level than the electric system. These three concepts are the gaseous core reactor, the nuclear pulse and the controlled thermonuclear reactor. The Gaseous Core Reactor operates on the same principle as the Nerva Reactor, namely, the heating and expulsion of hydrogen. The difference is that the nuclear fuel is so hot that it is gaseous instead of solid. The hydrogen is heated to much higher temperatures, causing the specific impulse to reach values between 1700 and 500 seconds, depending on the degree of perfection of the engine. Thrust accelerations of 0.01 g or higher can be obtained. The nuclear pulse engine propels the spacecraft by the detonation of nuclear charges behind the vehicle. These charges, called pulse units, contain small nuclear detonation units of safe explosive power as fuel, and metals as propellant. The explosion turns the metal into a plasma and hurls it at the aft end of the vehicle where it is intercepted by a pusher plate whose shock absorber system softens the impact for the crew. This may be compared to the action of tires and shock absorbers in an automobile. During propulsion, the pulse units are ejected and set off at the rate of about one per second. Several thousand pulse units may be needed per round-trip. Any desired thrust can be attained at specific impulses ranging from 2500 to over 10,000 seconds, depending on how well the drive is developed. The drive is safe for the crew but not for the ship's environment. Therefore it could safely be used in the solitude of earth-moon space and the vastness of interplanetary space, but not readily in near-earth orbits. The controlled thermonuclear reactor generates energy by nuclear fusion in which heavy hydrogen (Deuterium) and the Isotope Helium-3 react at 100 million degrees in a magnetic bottle to form the common Helium-4 and protons. These reaction products are mixed with Deuterium propellant and the hot gas is exhausted, providing thrust. Specific impulses of 6000 to over 20,000 seconds are attainable at thrust accelerations of 0.0005 to 0.001 g. This is the most complex of the three advanced nuclear drives. The nuclear pulse is least complex. A comparison among the various advanced nuclear systems and the nuclear-electric drive shows the nuclear pulse to have the most favorable characteristics.

Acquisition of the solar system for humanity, in particular for its resources, depends ultimately on the availability of the nuclear pulse drive.

The nuclear-test-ban agreement unintentionally inhibits its development at this time. It is highly desirable and important that the test-ban agreement be altered to permit the use of nuclear pulse propulsion under safe conditions in interplanetary space and in earth-moon space.

Necessity provides the reasons for making space operations a matter of routine. In the next 30 years, the process of converting once alien and hostile space into a useful and enjoyable resource will be accelerated greatly. The discovery of our civilization's many needs for space has hardly begun. Thirty years ago, a projection of needs leading to today's routine space applications and operations in earth orbits sounded preposterous. What are the needs that now suggest incentives for the "preposterous" thought of making solar-system operations routine? New, not-yet-anticipated needs will arise from the interplay of space with our growing civilization. However, we do not have to rely on unknowns to make our case. There are foreseeable needs, resulting from a rather unique and fascinating confrontation. The need to elevate the living standard of over half the present population, and to accommodate billions more properly in the next 30 years, sparks greatly-increased demands for raw materials and food. This adds up to an "irresistible force" that, in the foreseeable future, will meet the "immovable object" of strictly limited earth resources. These limitations represent the difference between using and ravaging earth.

This small planet alone cannot indefinitely supply us, provide adequate living space for human, animal and plant life, and maintain environmental balance so essential to our sanity and survival. Earth's resources, including those from the oceans, must eventually be supplemented from extraterrestrial sources. Space and other planets are not outlets to relieve the present world population pressure. This problem can be resolved only on earth. But the better we can preserve our planet as a healthy setting for mankind, the greater will be the number of people accommodated without hardship.

We need increasing quantities of inorganic raw materials for industrial purposes. Some of these, such as mercury and gold, are becoming rare on earth even now. Others will also become rare in the face of rising demands. The most likely sources of valuable heavy metallic minerals are Mercury and some of the asteroids. Distance and transportation time are no object, once the supply process is developed. Transportation cost can be reduced to competitive values by developing appropriate propulsion systems. The nuclear pulse drive could be developed even with our present technology. All these factors, plus the expendability of other worlds, far outweigh the nearness factor used in arguments for ocean versus space exploration. The point is that we must look elsewhere as the supply of easily-accessible raw materials diminishes on earth. The future will show what can be obtained economically by ocean-floor mining and by mining extraterrestrial deposits.

We will of course continue to use terrestrial resources. We will increase the skill and scope of their exploitation, with special emphasis on the oceans. Learning more about earth by exploring the moon and planets will contribute importantly to this goal. As we gradually begin to complement earth's resources with extraterrestrial resources, we will need adequate nuclear interplanetary transports. Proper transportation is the key to efficient use, and efficient use is the key to a market. A market is not an independent thing in itself, but is created by a product and transportation. Thus, the key to efficient use of the solar system is the giant nuclear pulse transport capable of pushing millions of pounds of payload. It will draw the planets together just as the great ocean vessel compressed the space between the continents.

Some people may wonder if we can afford all this. "Why spend vast sums in space, if they are so urgently needed on earth?" is a common question. These sums are spent on earth and for the benefit of people. Can humanity afford to spend five to 10 trillion dollars in the remainder of this century for defense against itself? Can humanity afford not to spend it on improving its human resources (world health, world education), on developing its terrestrial resources (world land development, ocean utilization), and on unlocking its solar-system resources?

The question seems trivial; and yet, we as a species appear incapable of doing the obvious. It is as if we are caught in a nightmare – knowing that we must run fast, yet being unable to move, to act rationally. We have not yet freed ourselves from the entanglements of ancient notions. Our minds are befuddled, our vision is clouded, our foresight poorly developed. Neanderthal men of the space age, we are not yet free and mature enough to face up to the potentials of a cosmic future. For thousands of generations have we dreamt in the womb of earth's ecosphere. Now only a generation or two is left for us to be born again into a greater world in which there are many mansions.

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Professional action: The dynamics of an industrial arts association

Howard S. Decker

It is always nice to begin a general session with some sort of an agreement; and, if we can agree that one of the meanings of dynamics is the pattern of change or growth of objects or phenomena, then it must inevitably follow that I have license to pay tribute to some of the historical figures whose activities gave relevance to our meeting here today.

I would like to pay tribute first to that wonderful art teacher, Miss Daristhe L. Hoyt, who addressed the Industrial Art Teachers Association in 1882 on the subject of The Industrial Arts, Their Relationship to Fine Arts; to S. R. Thompson of Lincoln, Nebraska, who petitioned the National Education Association and who was the first president of the Industrial Education Department of the NEA in 1876; to Charles A. Bennett, one of the founders of the Manual Training Teachers Association of America, which later became the American Manual Training Association and even later the Eastern Manual Training Association; to William S. Mack, Western Manager of Prang Education Company, for his leadership in founding the Western Drawing Teachers Association in 1894, which became the Western Drawing and Manual Training Association and finally the Western Arts Association in 1919; to Charles R. Richards, president of the American Manual Training Association in 1898 and 1899, who led the movement to join the Eastern Manual Training Association with the Eastern Arts Association in 1909 and who, with his colleague, James P. Haney, brought together educators and industrialists to form the National Society for the Promotion of Industrial Education, which later became the National Society for Vocational Education, which in turn became the American Vocational Association on March 20, 1926; to Robert Selvidge for his work in founding the Manual Arts Conference of the Mississippi Valley in 1908 and who, according to the History of the American Vocational Association, spearheaded the revolt of industrial arts teachers against the manner in which AVA handled the affairs of those industrial arts teachers who were members of that association and which led to the amending of the constitution of the AVA to create the Division of Industrial Arts.

But, enough of the ancient histories of associations which led to the formation of our own. Rather, let us take a look at some of the concepts which motivated these persons and why they did the things they are so noted for.

Industrial education in the United States has developed under several somewhat distinct philosophies of what should constitute the education of young men and women, and, from the beginning, these philosophies have been in opposition.

Woodward's original approach to manual training as a part of a three-phase systems approach to engineering education received opposition from:

(1) the engineers;
(2) the Sloyd utilitarians, led by Larsson;
(3) the industrialists who wished to create narrow specialized tradesmen; and
(4) the progressive educationists, who eventually so modified the program that Woodward was wont to remark, upon viewing some underground experiments by a member of the Washington University staff, "Has manual training come to this?"

There were others who advocated that manual training had no value unless it includes certain art activities and, as late as 1922, Charles R. Richards petitioned the General Education Board of New York City to conduct a national survey of the industrial arts, which resulted in the publication of the report entitled, Art in Industry. Many colleges and secondary schools still have joint fine and industrial arts departments.

After the passage of the Smith-Hughes Act, a great number of educators began to see manual training and industrial arts activities as necessary prerequisites to effective vocational trade training. However, in the end, it was the Dewey progressives headquartered at Teachers College, Columbia University, who eventually won the field. Simply stated, Dewey saw industrial arts as a way to develop in the young an industrial intelligence, not mere trade efficiency. Teachers College, Columbia University, progressed from manual training to manual arts to industrial arts within a period of 15 years. As Teachers College-trained administrators were sent out into the field and became the principals of the thousands of evolving junior high schools, they led the fight in the adoption of industrial arts as a required subject in the public schools of this nation. This faction centered its activities around the Eastern and Western Arts Associations and the NEA.

A young graduate of Teachers College, also dissatisfied with the manner in which the industrial arts profession was being treated by professional associations, beginning in 1936, held industrial arts meetings at NEA and American Association of School Administrators conventions, which in 1939 led to the founding of the American Industrial Arts Association. This still-not-so-old Columbian graduate is sitting on this platform. Of course, I refer to Dr. William E. Warner, the first president of the AIAA.

The AIAA grew and prospered under a variety of leaders, including Heber Sotskin, elected first vice-president at the 1939 meeting; Gordon O. Wilbur, first president of the AIAA to be elected by mail ballot; Burl N. Osburn, who served as president of the Association, incorporator of the Association, and editor for many years of the Industrial Arts Teacher; George Ditlow, who developed the AIAA convention into the large and profitable venture that it is today, and many others too numerous to mention.

As the Association grew, it began to expand its activities, and special interest groups were formed. The American Council on Industrial Arts Teacher Education had its first annual meeting in 1951. At that same meeting, an organizational meeting was held to initiate the American Council of Industrial Arts Supervisors, and state representatives of the AIAA were appointed.

In 1955, a National Council of Officers of State and Local Industrial Arts Associations was formed, and the executive board was expanded to include a vice-presidency for Canadian teachers of industrial arts.

Five executive secretary-treasurers have served the Association: John J. Hatch from 1939 to 1947; D. Arthur Bricker from 1947 to 1953; Kenneth W. Brown from 1953 to 1960; Kenneth E. Dawson from 1960 to 1966; and from 1966 to 1969, myself.

In 1942, the AIAA became a department of the National Education Association. However, it was not until 1960 that the decision was made to move to the National Headquarters Building. At the time of this decision, the total assets of the Association were somewhat less than $6,000. With the move to Washington in 1961 and a considerable financial boost by the Ford Motor Company and the National Education Association, the AIAA began a radical growth pattern which continued until 1965.

In 1961 to 1965, the Association enrolled almost one-third more members and, beginning in July 1966, began a second growth pattern which has almost doubled the previous membership. Using just two categories of membership, life and regular, we are approaching the 8,000 mark. During the business meeting at this convention, I plan to announce that the reserves of the Association are over 10 times the figure reported for 1960. At the same time, I must report that industrial arts membership in the Eastern and Western Arts Associations is almost nonexistent and that membership in the Industrial Arts Section of AVA is in the vicinity of 1,300, with about 800 of these being members of AIAA.

The phenomenal growth of the AIAA since its formation can be attributed to its steadfast policy of viewing industrial arts as a part of general education and its status as the only professional association which devotes its entire energies to the promotion of industrial arts education at all levels in the American school system.

As executive secretary of the AIAA, it gives me special pleasure to report on the sound membership and financial basis upon which we operate and to pay tribute to the many individuals who have made this possible and especially to those who are represented on this platform today.

If this, then, briefly, is the past and present of the AIAA, what shall be its future?

Federal legislation. As I am sure you realize, the AIAA is active in the area of federal legislation. The first target of the AIAA was the National Defense Education Act; and, as early as 1961, the minutes of the executive board mentioned this goal. Industrial arts was included in Title XI of the NDEA in the spring of 1965; and, in October of 1966, industrial arts became one of the categories of Title III of the NDEA.

At the present time, industrial arts is eligible to receive assistance from almost every general education federal act. Beginning in 1967, the Association has worked diligently through the state association officers, state supervisors of industrial arts and the AIAA state representatives to secure adequate funding, especially for Title III of NDEA, which has meant so much in purchasing equipment for industrial arts laboratories.

Beginning with the last year of the Johnson Administration, with the escalation of the war in Viet Nam, until the present, there has been little opportunity for our profession to initiate legislation. At such time as additional federal monies for education become practical, then our Association must push for additional categorical legislation. However, in the interim, the Association has endorsed the $6 billion NEA package designed to relieve the burden of increased teacher salaries from the local boards of education.

Outside financing. At the present time, less than half of the budget of our Association is derived from membership dues; and, in addition, during the year just past, the Association was able to secure financing from outside agencies, including the US Office of Education and the Rockwell Manufacturing Company, to the extent of almost equaling the total amount collected from the dues of its regular and life members.

Outside financing made it possible for your Association to:

(a) conduct five regional institutes throughout the United States, involving several hundred state association personnel, in the area of leadership training;

(b) conduct a national symposium in which over 85 teachers, supervisors and teacher educators participated;

(c) produce eight color films and four tapes on subjects of professional interest (and I am happy to report that these tapes and films are in great demand in our profession); and

(d) conduct, after this convention, a post-convention meeting of state association representatives to plan rather intensive assistance to one or two of our state groups for the purpose of strengthening their in-service training efforts.

I sincerely hope that we will continue our efforts to receive outside financial assistance. At the present time, the AIAA is developing two new proposals designed to further this end.

Publications. The AIAA has long been a major publisher in the field of industrial arts education, and your Association has consistently published five issues per year of The Journal of Industrial Arts Education and a great assortment of brochures and audio-visual aids.

These publications have been a constant drain on the finances of the Association, since for the most part our publications have not been purchased widely by the industrial arts teachers in the field. Our most recent audio-visual publications have done slightly better, and they include two slide/tape presentations developed by Everett Israel at Fitchburg State College; and, of course, the films and tapes developed at the Washington Symposium.

Dr. Ronald Koble, currently chairman of our Publications Committee, has made a serious attempt during the past year to sample the membership of our Association in order to determine the types of publications which industrial arts teachers feel they need to see, are willing to read and to purchase. The result of Dr. Koble's survey of more than 500 members of our Association has been made public at this convention, and I trust this will serve as a guide to our incoming executive secretary.

Your Association has had good success in developing material for publications by agencies outside our field. In 1967, Dr. Robert Woodward and myself wrote a chapter for the Curriculum Handbook of the American Association of School Administrators; and, in 1968, Dr. Ralph Bohn and myself placed an article in the Bulletin of the National Association of Secondary School Principals. This article was also made available by the NASSP through its reprint service. Through these publications, some 50,000 administrators were able to read something about the latest developments in industrial arts education.

The work of the AIAA in the area of publications must be continued and reinforced. We are the only Association which is exclusively devoted to the problems of industrial arts education, and there is really no George for us to let do it.

Community relations. Industrial arts and its relationship to the community of scholars and the larger community must be strengthened. The AIAA, over the past few years, has developed a relationship with other educationally-oriented groups, including The World Confederation of Organizations of the Teaching Profession and the Consortium of Professional Associations for Study of Special Teacher Improvement Programs. This Consortium includes such organizations as the Modern Language Association of America, the American Historical Association and the Association of American Geographers. Dr. Ralph Bohn and myself are your delegates to this Consortium; and, early this year, we submitted a list of persons in industrial arts to be included in a large scholarly meeting under the auspices of CONPASS. However, since I am writing this manuscript in early March, I cannot report on its outcome.

In addition, Dr. John Conaway is acting as liaison between the AIAA and the American Association of Colleges for Teacher Education and the National Council for Accreditation of Teacher Education. Your National Office has also developed an excellent professional relationship with the industrial arts division of the AVA. The relationship of AIAA to the National Aeronautics and Space Administration has resulted in their excellent publication in the industrial arts field.

In many other ways, your Association has achieved relationships with other parts of the educational community. Much still needs to be done. It would be my hope that the AIAA would continue to implement relationships with other educationally-oriented groups, including the Association for Supervision and Curriculum Development, the National Science Foundation and Civil Aeronautics Board.

In the area of our relationship to the larger American community, our efforts have been minimal. I recommend that the AIAA develop a massive program to acquaint the American public, and particularly the parents of American boys and girls attending the nation's secondary schools, with the opportunities available in industrial arts classes. In order to do this, we shall need to spend a considerable amount of money for the production of television films, press releases and other materials designed to attract the mass media.

In addition, your Association needs to achieve better rapport with the many minority groups which have achieved so much public notice in recent times. These would include those groups which have serious reservations concerning the dehumanizing effect of industry on the lives of our populace, and on those who find the general education aspect of industrial arts a much more palatable way to obtain their place in the world of work than narrow specialization in trade training with the resultant obsolescence of the skills learned.

In addition, we must earnestly publicize the fact that all available evidence indicates that a student who offers industrial arts credits for college entrance will, on the average, perform better in college than one offering only college preparatory subjects.

The Convention Syndrome. The local, state and national associations in industrial arts education use their convention time for the continuing education of their constituents to a greater degree than in any other subject area. We have reached a point in our development when we must begin to obtain administrative decisions at the local, state and national levels which will permit the attendance of industrial arts teachers at our meetings without prejudice to the salaries of these teachers.

I recommend that industrial arts teachers strive for the inclusion of their local, state and national association meetings as part of the continuing education of the industrial arts profession, and that we no longer consider the meeting which we are presently attending as a convention activity, but rather as a national forum in industrial arts education.

Last year, the AASA made the necessary changes in the format of their convention at Atlantic City to make it possible for school administrators to attend the meeting on this basis. There is no reason why our associations cannot also justify this step.

Togetherness. Since its inception, the relationship between the AIAA and the NEA has been one of mutual confidence. This relationship has continued to the present day. At the present time, some associations which make up the NEA family have begun to drift away from the parent association. I think, however, that the fine relationship that the AIAA has with the NEA should be preserved.

There is every reason to believe, because of changes in the NEA Bylaws, that beginning July 1, 1969, the AIAA must become a directly affiliated autonomous part of the NEA, rather than a department. I give equal assurance that our future relationship will be as valid as in the past.

Like the NEA, the AIAA must assist our affiliated state associations to achieve a better relationship with their parent group. In the near future, you will be asked to vote on an amendment to our constitution to give representation to the American Council of Industrial Arts State Association Officers. I trust that you will react favorably to this group; and, within the next few years, I recommend that the first steps be taken to evolve an eventually combined membership agreement with each of our state affiliates.

Quantity versus quality. In 1963 with the passage of the vocational act of that year, administrators in this subject area were given a mandate to perform significantly better within a five-year period. For a variety of reasons, vocational educators found this difficult to achieve. For example, using trades and industries as a case in point, the total national enrollment in the secondary schools was 249,119 in fiscal 1964, 252,709 in fiscal 1965, and 306,413 in fiscal 1966. Faced with these statistics, it was obvious that something needed to be done, since in the first three years of the vocational act, no great enrollment increase had become evident, even though vastly greater sums were being spent in the subject area.

About this time, someone decided that if somehow vocational education could begin to "count" the students enrolled in other subject areas, then substantial apparent progress could be made in vocational education, even though not one additional student was being served.

As a result, in fiscal 1965 a new category was added to vocational statistics, entitled "Office", and vocational education began to expand significantly on paper. In addition to business courses, many industrial arts courses began to be counted in the trades and industries category in order to swell the statistics in preparation for the reassessment which was scheduled in fiscal 1968. I am sure that many of those sitting in my audience have become a part of this statistical manipulation.

The AIAA was founded on the precept that there is educational relevance in both the manipulative and cognitive values in the industrial arts laboratory experience. It cannot endorse any enrollment counting scheme that does not add one new or additional laboratory experience to the lives of American youth.

During this presentation, I have not touched upon many other aspects of the current scene to which our Association must relate. They include: the industrial arts teacher shortage, the curriculum reform movement, leisure time activities and the new home repair and maintenance revival occasioned by the high labor costs of such services.

Dr. Decker is the outgoing Executive Secretary-Treasurer of the AIAA, and will assume a high-level faculty/administrative post at San Jose (Calif.) State College this fall.

acesia
general session addresses

The classroom—where the action is

Calvin F. Zuehlke

I am a classroom teacher in a junior high school with an enrollment of 800 students. I teach ninth grade students in drawing and woodworking plus some eighth grade semester classes of drafting, electricity and woodworking.

Time, tools and materials. These are some of our, shall we say, hangups. We talk about materials. We talk about instant. Everything today seems to be instant. We talk about instant resay; that is, how do we say it? Now we are talking about cybernation – the marriage of the computer and the automatic machine. I hope that I as a classroom teacher can tell it like it is, and I suppose I should be careful that it is like I tell it.

I am here today to give my ideas and views of teaching industrial arts in the junior high school. Our group at this opening session is called The American Council of Elementary School Industrial Arts. Some states call grades one through eight elementary; or grades one through six; some a middle school of sixth, seventh and eighth grade; some a middle school of fifth, sixth and seventh grade; and then you have the 6-3-3 plan and the 8-4 plan and so on. Nevertheless, we have come for one purpose in the next four days – namely, how to do a better job of teaching young people. Undoubtedly, you are here because of your initiative and open-mindedness.

When it comes to teaching and training our students to become teachers, whether in industrial arts or other educational pursuits, I do not have any stock answers, but I am going to relate what has happened to me, and I hope that all of us can regroup as needed to keep industrial arts a swinging type of educational offering for young people. I have been teaching for 18 years, and sometimes I feel like an old pro; but after attending our conventions, I know that I shall continue to be a rookie. As long as we teach, the many faces of education keep changing, keep moving ahead and never stop. I teach with people I believe to be outstanding in our junior high school – in social studies, mathematics, home economics, English, foreign language, physical education, music, science, reading, business, art, extra-curricular and athletics, library science, speech, special education, counselors and, above all, that man who carries a heavy load – our principal. We also have a superintendent who is for young people and believes in them, and I think this is extremely important. We talk about general education and we think too close to our own teaching area. We get too selfish in our capsule of power. When we reach the crest of an attitude where we do not respect the fields of teaching of our colleagues, I doubt if we can expect any reciprocity. Let us continue to break down the barrier and keep the reentry path open to our colleagues in those halls of education. We should be big enough to compliment them when they deserve it.

When school commences in the fall, I enjoy meeting my classes, just as you do – the young people with their new clothes, twitching nervously like racehorses at the starting gate, walking bolt upright, dropping things, tripping over their own feet, noisy and looking around curiously as they move from class to class. In the spring when they leave, clothes worne, some are too small, and I wonder if I have ignited any spark to help any of them. As classes get under way, I try to help the students with their questions about anything pertaining to their immediate needs of school life. After two or three weeks of school, I hand out an information sheet – a short form – and use this to find out about the student. Basically this form relates his likes, dislikes, experiences with tools, hobbies, what he is good at doing, things he has constructed, and I have him tell about the most fun that he has ever had. If a teacher can gain the confidence of his students without a popularity contest, he is well on his way toward a successful year of teaching. I feel quite strongly about getting to know the student, partly through the information sheet and partly through keeping a hot line to the counselor as we bombard our words of wisdom into the gray matter.

I like to take the information sheet, study what the student has written and try to look for his strong points to help him realize his potential and to gain confidence in himself. After my students complete a project, I like to have them sit down and write about the project. For example, if you had to build it over, would you build the same project? What did you like about your project? What didn't you like? What did your parents say about it? It's interesting to note what the students say in comment about working on their project. I had a student one year who replied, "This is the first time in my life that I have ever done anything that I've had confidence in doing."

I have also had the students use their projects as ideas to follow through and to redesign in the drafting room for some type of article that would fit in a spacecraft. In other words, they design for space travel. That means they would have to redesign the whole concept of the project. What I like about it is that the students have done something, they have built something, they have some background; and now they can reach back and use this experience, put it on the drawing board, and let their imaginations run wild into some type of design for a space ship.

Some days we have to deal with a lot of trivialities as part of the teaching day. The days when we are operating at a thousand percent efficiency are great; but then on other days, we are operating a quart low toward good teaching. We human beings just do that. It has taken me a few years to realize how much more fun your work can be if you let the students help you teach. I have had students whom I have failed to reach but another student has accomplished what I could not. We need to build on the student's strong points, and this will help him to strengthen his weak points. Help him to believe in himself. Build his confidence.

We must also keep working hard to keep the student identified as an individual. You know that when you have a given number of students in class, facing you every day, it's difficult to keep reminding yourself that you have a group of individuals in that room. More than a group – they are individuals, of course.

Now let's get into the nuts and bolts of teaching. We start at the source; namely, the person who has chosen teaching as a start toward his life's work. Yes, I said start toward his life's work. Every human being is created for a purpose, and he is gifted with a special talent. Our job is to help him realize, cultivate, explode and get his talent or specialty into motion. You, as professional educators, have done this many times over during your career. What in your own minds would you say contributed toward making successful teachers out of those young people with whom you rubbed elbows for four years or more? No doubt you have had disappointments, ones you thought would be outstanding teachers and never left the house. Now we talk about teachers as favorite teachers, as we look back at our own school days and college days. I'd like to ask you to think a moment as to who was your favorite teacher either in high school or college. Now I'd like to throw you a curve and ask who was your best teacher? Many times it will not be the same person. We need the type of person who can cope with the world of work, speak its language. Look at us. Remember when we started teaching? Remember the nights of midnight oil? Still have some! Look at your hands. Have we lost something – why? Do you wear a white shirt every day because you'd rather not get into the dust, grease and ink of the shops? I don't think so, if you are here today. Do you really want to work with young people through someone else and stand in line to get the credit? I don't think so. I believe that these are some of the very things that the potential teaching candidate might be thinking about once he has moved into the classroom where the action is.

Three years ago I started watching my students as they would go throughout the school year and try to single out those I thought would make good teachers. At the end of the school year, I would call these students down to the drafting room. They did not know why they were coming, but once they got there I explained to them that I would like to tell them about teaching. I said, "I think all of you sitting in this room at this time would make good teachers." You should have seen the looks of amazement and shock on the faces of some of these students! But I went on to explain the advantages and disadvantages of teaching, and I told them I thought they would make good teachers because they had the personality, they had an inquiring mind, they had the ability to work, they were willing to take chances, to try things and to get along with people. Those boys are seniors in high school this year. I have followed some of them, the ones I thought were in trouble with grades. One particular student was a D student in junior high school and came up to a B- average in senior high school. Whether he becomes a teacher or not is irrelevant compared to what he has done for himself – he has found himself, he has gained confidence and he has opened new vistas of life into which he could fit very well.

As we start to teach, we need to give ourselves pep talks. We cannot expect anyone to burn the candle at both ends for very long. If we do, we will go stale. One of the most difficult things to do is to be able to find a way to relax, a diversion to relieve the mind of tension so that we will be better men in the classroom tomorrow. I am sure that you have known good men we have lost from teaching who burned themselves out – they couldn't relax. They carried the whole world on their shoulders, worries and all. They had all inlet and no outlet for their emotions. Some of them, I think, were committed to death, too. Now each year when school is out I like to go fishing to the Canadian border of Minnesota. I fish with a group of fellows; each one of us has a different occupation. One is a lumberman, one a pharmacist, one runs a cafe, one manages a block plant, one is a bricklayer and one is a hardware man. So, we have a good cosmopolitan group, and it is interesting that we can discuss a lot of things, but we don't always have to get back to and talk shop. And, of course, we all think that the other fellow has the best job. But by and large, when we head home, I think we are all pretty well satisfied that we have the jobs that we do.

The teacher starting his career needs good backup morale to get his classes under way, and he should possess that extra sense of preventive measure for difficult teaching hurdles. He needs confidence to handle discipline, foresight for trouble spots; he needs to get the feel of teaching which only grows as he grows. Keep a sense of humor. Problems aren't important unless you have the same problem next year.

A teacher has to do his homework and planning. Here we are in the state of Nevada. How many of us took the time to read about this state and what it offers? We missed an opportunity if we didn't. We should know the territory.

Let us now project our energies to the key of all teaching – the boys and girls. As we teach from day to day, these people are hopefully expected to learn from day to day. Again, too often we keep forgetting the total concept of a good general education. We need to try harder to keep education meaningful to the students. By this, I mean how does it fit into their future life of working and living? We can help the English teachers make their subject meaningful in our classes, also. A case in point: I took a college night class on reading disabilities, and the instructor gave us a list of the common prefixes and suffixes. I got to thinking about that list and decided to hand out copies to my classes, so that they could carry them in their notebooks. Before handing it out, I explained to them how we all have to go to a dictionary and look up the meanings of words, which is time-consuming. So I presented the list of prefixes and suffixes to them as their instant dictionary, hoping that it would be useful. After a few weeks I asked the students how many had really tried to use this idea. To my disappointment, only a few were trying it. I am not going to give up on it, however, because I think it has a lot of merit. I feel as though I can do a better job of presenting it so that it is more meaningful to them. I also had a complete list of industrial arts texts and reference materials made available to me by the librarian. I handed out copies of these to all of my students. This was successful because the students began checking out these books just for interest and reading pleasure.

There is a miracle happening in education in that we are bringing the schools to the students. We have technical and vocational schools within easy driving distance from many areas; junior colleges and new four-year colleges are being built also. A couple of years ago I was driving north out of the community where I live to referee a basketball game, and there was a hitchhiker on the road. Now I don't endorse picking up hitchhikers, but when I was in college I hitchhiked a lot so I do pick them up because I think back to those days when I wanted a ride myself. So I picked him up, and we got to talking. He told me he was going to one of the vocational schools thirty miles east and I asked him what he was taking. He said body and fender work. So I asked him how he liked it, and do you know that young man exploded into enthusiasm, and said he was so happy that he had a chance to go to school to learn a trade to get out on the job and on the payroll. It was very rejuvenating to me to hear this young person expound right from the heart as to how thrilled he was to have this opportunity to go to school. (One thing that bothers me is that we strangle our college freshmen with constants before they get a taste of the field of interest they want to go into. Partial proof of this is the dropout rate among college freshmen.)

What is important to our students should also be useful guidelines for us in attaining teaching goals and objectives. This week of convention activities is our golden opportunity to start plans for change in our teaching. We should be able to pick a few brains and filter out some new ideas to get them into motion. These new ideas can be injected into our current teaching curricula, and as this happens some of the obsolete ideas will fall by the way. We need to keep implementing, trying something different. Be original and think up some new ideas instead of waiting for the ideas from the mass production line of curriculum guides. Let us be cautious of having silent shops and dusty machines. In teaching young people the many facets of human relations, creativity, student and teacher relationships, inspiration, enthusiasm, motivation and self-expression, Einstein stated that imagination is more important than knowledge. Above all we need time to think. We should be extremely careful as to how much we add to our elementary day of teaching; we should be cautious as to how fast we push that young nervous system into learning. I haven't heard of anyone being able to speed up the growth of the nervous system. When elementary students start to develop ulcers, and they are, we may have to take the credit for that also.

We should be the first ones to endorse a crash reading program, because too many students move through school year after year as victims of being cheated from opportunities because they cannot read. The future is fun because we awaken to it every morning. With cybernation implementing technology, we now have talking typewriters and a checklist society. Let us not forget patriotism in the classroom. Build a new unit in conservation and fit it in now. Mother Nature is still our number one outlet for relieving tension.

We in industrial arts have the grandest opportunities for getting to the young people. The problem is that we do not work hard enough to expose all of the good things that we do. I think that the American Industrial Arts Association does a good job in keeping us informed of our own happenings. What we need now is increased effort to tell it like it is to the man on the street. This means increased public relations; we need a goodwill ambassador on the road. All of you have heard of Pike's Peak, but did you know that there are 25 mountains in Colorado higher than Pike's Peak? There's public relations at its best.

In conclusion, I would like to read to you my one-page philosophy of teaching: To me teaching is the mastery of what I can get out of my students, rather than what I am able to convey to them. I believe that a good teacher should drive his efforts toward helping his students to strengthen their weaknesses and to build on their natural talent. It shall continue to be that the building of self-confidence in an individual is one of the vital assets to good teaching. I like to teach my students that they can do it, but not without their best effort. There are many things that will motivate a spark in an individual on his way towards realizing his potential. Some of these are self-respect, initiative, respect for others and a willingness to take chances and to do things. We should try our utmost to remain optimistic. To be a dedicated teacher, one should be willing to give time to his profession. This can be done by serving on committees, attending meetings regularly, promoting his convictions, joining his professional organizations, and sacrifice. None of these can be forced upon the individual, but need to come from within. A good teacher needs to keep current in his field with the news media and the national and local economy. He should read a daily newspaper. A good teacher should be a good listener. A teacher should cultivate understanding among his fellow colleagues as to their problems and needs in their field of education. When we add it all together, teaching is for the young to learn, for the adults to build on, and for the aged to contemplate.

Mr. Zuehlke teaches at Worthington (Minn.) Junior High School.

ACESIA annual report for 1968-69

Program need. A nationwide interest in industrial arts for the elementary school is evident by the number of letters to ACESIA requesting information about programs, research and background material. Currently ACESIA is in the process of developing material that can be used as a guideline for establishing programs. It is anticipated that this material will be available early in 1970.

Publications. Two newsletters were distributed to the membership. A favorable response was received to an editorial suggesting a national curriculum for elementary industrial arts. William Hoots, Jr., printed a membership directory and a membership flyer, the latter of which was distributed through the AIAA packet mailing service. The ACESIA Constitution and By-laws was printed by Vito Pace. Revision of the Bibliography for Elementary Industrial Arts is under way by Art Stunard.

Planning grant. The EPDA leadership planning grant by ACESIA and the National College of Education in Evanston, Illinois, was not approved by the Department of HEW. The proposal was written by E. Art Stunard, with an assist by Eberhard Thieme.

NDEA Institutes. ACESIA material was sent to the two NDEA Institutes at Eastern

Illinois University and The Ohio State University.

Research. Al Wutti continued his research activities and found the pattern of elementary school organization and philosophy to be widely divergent.

Finances. Balance as of March 20, 1969: $1,135.68.

Membership. Total members on mailing list: 277.

--Eberhard Thieme, President
ACESIA

acias
general session addresses

The industrial arts trainee

Herbert Siegel

Introduction. To the traditional teacher-training institutions, this plan might seem to be heresy. But, when we consider that the present college recruitment programs have not produced the number of industrial arts teachers required, we are compelled to turn to untried recruitment procedures.

The major difference in this proposal is that underprivileged students will be given an opportunity to achieve their aspirations and obtain positions of dignity and responsibility. The fact that the industrial arts trainee will have six years of experience in a shop situation, plus a baccalaureate degree, should prepare him for a superior job of teaching.

Limited industrial arts training facilities. Unfortunately, one of the greatest deterrents to an adequate supply of college trained industrial arts teachers is the lack of teacher training facilities.* In the Empire State, which proudly boasts of its teacher training institutions, there are only four colleges which provide an industrial arts curriculum.(2) Two of these universities, Oswego and Buffalo, are part of the State of New York Universities. The City College of New York is part of the New York City Board of Higher Education, and New York University is a private institution. These four colleges provide the majority of industrial arts teachers for New York State. When we consider that industrial arts is a mandatory subject in the junior high schools, and the large number of junior high schools in New York State, we can readily understand the inadequacy of industrial arts teacher training facilities in New York State.

The number of graduates from the four teacher training institutions is very small indeed. Should, by chance, all of them come to New York City for employment, they would not meet the needs of the Industrial Arts Department for teaching personnel. Although New York City residents make up a considerable portion of the student body at Oswego and Buffalo, fewer than five students a term return to teach in New York City upon graduation.

This term, for the first time, a large group of ten City College graduates joined our teaching corps. It remains to be seen whether these students will remain with us, or whether they are using their jobs as interim teaching positions until they can find a more desirable position in the surrounding communities. The industrial arts student body at City College consists mainly of engineering transferees, thereby limiting the opportunities for high school graduates to register at this school.

The graduating class of New York University is the smallest, rarely more than four or five students. Two or three of these students usually find employment in New York City.

In today's competitive teacher market, it is understandable that many college graduates choose to work outside of New York City. Therefore, we must provide an additional avenue of entrance into the teaching of industrial arts – one that would attract the average high school graduate; one that would meet the future educational needs of students from under-privileged areas; and one that would assure the New York City Board of Education of future teachers.

Alternate "C" candidates. Since 1960, the greatest source of teacher recruitment has come to us from industry. Although these teachers eventually meet the qualifications required by the Board of Examiners (which is 54 college credits in industrial arts education, in addition to other requirements), there are many aspects to this type of candidate that need to be improved. Although all candidates are required to pass a performance test, it is impossible to test their ability in depth. The knowledge and understanding required by a teacher of industrial arts extends beyond the ability to construct a project. This type of knowledge and skill, which is most desirable in our teachers, is best obtained in a formal educational program.

Modern industrial production today requires specialists; therefore, it is quite possible for a craftsman to meet the printed industrial requirements on his application and still be extremely limited in his industrial experience. It would be possible for a candidate to work in a machine shop for five years and never do anything but operate a grinder. This example of specialization can be duplicated in any of the larger industries. This type of specialization again would be eliminated by a formal educational program.

The problem of teacher turnover in our school shops does not contribute to a good educational program. Many of the licensed craftsman candidates accept a teaching position and after a term's work return to industry, because they are unable to provide for their family adequately; or the problem of qualifying for the license becomes an insurmountable one in terms of both the financial investment and the length of time required to complete the college courses. Although this type of individual has been used to bridge the gap, his full potential is not realized until he completes his college studies. Another factor which must be considered is the period of service which the craftsman-teacher can give to the educational system. Many are in their 40's, 50's and even 60's when they first file their applications, so, consequently, due to the mandatory retirement age, their service to the system is limited.

On the other hand, we are the first to admit that if it were not for the industrial arts teachers coming to us from industry, we would be in a very, very bad situation, replacement-wise. We need the industry-trained teacher to fulfill our immediate need for teachers, and the community college- and college-trained teacher for our long-range program.

A new source of industrial arts teachers. Due to the limited facilities of our teacher training colleges, they have been able to accept only a limited number of new applicants each term. Consequently, it is impossible for them to graduate the number of trained industrial arts teachers to meet the needs of New York City. What is needed is a new source of teacher recruitment. This source of new teachers could be developed, if the opportunity for professional training were more realistic in its entrance requirements, and financially feasible for the potential teachers to earn a stipend that would help them to maintain themselves while attending professional courses. To accomplish this we would need the cooperation of the New York City Community College to provide an industrial arts education.

This untapped source of potential teachers may be found in our very own high schools. There are many high school pupils who are deprived of a college education because of limited or sometimes non-existent parental financial support. More often than not, these students are compelled to find employment so that they can contribute to the economic needs of their parents and family.

In sixty of our academic high schools, industrial arts is part of the school curriculum. Undoubtedly, there would be one or two students in each graduating class who would take advantage of becoming a teacher of industrial arts. In schools such as Brooklyn Technical High School and Stuyvesant High School where there is an exceptionally fine industrial arts and technical program in operation, there would be more than enough high school graduates to start a pilot program leading to an Associate Degree in Industrial Arts Education.

Selection of students. The responsibility for the selection of high school graduates for the Industrial Arts Trainee Program should be divided between the Community College and the Board of Education. Perhaps the Board of Examiners should examine the candidates by giving them an aptitude test and a general intelligence test before recommending them for a school assignment as an industrial arts trainee.

Nature of proposal. This proposal has been developed by the Office of Personnel, the Director of Industrial Arts and the Board of Examiners with the cooperation of the New York City Community Colleges. It is for the training of industrial arts teachers for the academic division of the New York City schools, which cover elementary schools, junior high schools and academic high schools.

It is recommended that a new position to be known as industrial arts trainee be established in the New York City schools for recent high school graduates with a background in or an aptitude for industrial arts.

This would be a six-year program. The first three years, the trainee would be required to obtain an Associate Degree in Industrial Arts, and during the second three years, the trainee would be required to complete 64 credits in liberal arts at a teacher training college.

The establishment of the position would help:

(1) To provide qualified and interested young men, with limited financial means who might otherwise not go to college or aspire to teaching, with an immediate opportunity to embark on a career in the public schools of the City of New York as trainees in industrial arts, and after completing a course of academic training, to qualify for license as teachers of industrial arts;

(2) to augment the supply and upgrade the quality of industrial arts teachers so as to better the education of the children of the City of New York; and

(3) to provide a source of industrial arts teachers for the New York City Board of Education.

The project is specifically designed to provide 144 clock hours of training in each of the following: general woodworking, mechanical drawing, general electricity, general metal working, graphic arts, general ceramics, general textiles and advanced shop electives. The trainees will also receive professional training consisting of 60 hours of industrial arts methods laboratory, 60 hours of combined general and educational psychology and 60 hours of supervised student teaching, provided by the industrial arts teacher.

Training requirements. The new position of industrial arts trainee would offer a challenge to youth and would provide a good potential supply of future industrial arts teachers. It is hoped that young people who are genuinely interested in working with children would be attracted. The financial remuneration that is recommended would give added impetus and incentive, especially to those who could not without such help be able to consider teaching as a life's work. It is proposed that industrial arts trainees be paid a salary of $2,500 a year, when the trainee is working on his Associate's Degree in Industrial Arts Education, and $3,600 when he commences on his liberal arts program, at a four-year college.

Under the proposed plan, an industrial arts trainee would work one-half day on every day when the schools are in session. Work schedules would be flexible and arranged so that the trainee might pursue the required course of study at college. Since the industrial arts trainee would be required to pursue higher education to the extent of obtaining a baccalaureate degree, before he is issued a regular teacher's license, and since many who may apply have limited means, serious consideration should be given to the allocation of Manpower Training and Development funds, or any other agency, to assist the trainee either in whole or in part with his education. Perhaps the national war on poverty campaign could make funds available for this purpose. This phase of the proposal merits analysis and further study as it may be a prime factor in a young man's decision as to whether or not to choose industrial arts teaching as his career.

There are 60 academic high schools and 150 junior high and intermediate schools in New York City, in which industrial arts is taught and in which the services of one or more trainees could be used to good advantage. The duties of industrial arts trainees would be:

(1) To prepare, under direction of the chairman or acting chairman of industrial arts, demonstration materials, models, visual aids, mock ups, etc.;

(2) to operate audio-visual equipment;

(3) to help prepare sketches, drawings, stencils, etc.;

(4) to assist in first and second echelon maintenance of tools and machines;

(5) to operate mimeograph and duplicating machines for teachers of industrial arts;

(6) to assist in the storage and distribution of supplies and to maintain inventory records;

(7) to observe teaching routines and procedures; and

(8) to serve as a student teacher, while obtaining his liberal arts credits.

Schedule. It is proposed that approximately 30 trainees begin their training each year. This figure takes into account a 10% to 15% rate of attrition, since some may find that they are not suited for teaching, and still others will not be able to maintain themselves in the teacher education program. Industrial arts trainees would be certified for continuation on the job on the basis of satisfactory service in the schools and satisfactory completion of 22 semester hours of college courses each year leading to an Associate Degree in Industrial Arts. Community College facilities are available for teacher training instruction in woodworking, metalworking, electricity-electronics, drafting, machine shop work and graphic arts. Upon obtaining an Associate Degree, the trainee would be required to continue his education and obtain a baccalaureate degree in industrial arts from an accredited four-year college. Degree requirements should be completed within a period not to exceed six years.

FOOTNOTES

* The lack of training facilities is especially apparent in New York City, which employs more than one-half of the industrial arts teachers in New York State.(1) The only tuition-free teacher training college in New York City is filled to capacity, while the point cost at New York University is usually prohibitive to the average high school graduate. Omitting a foreign language, the pre-med and the industrial arts major are both required to meet the same scholastic requirements for college admission. These requirements are eminently unrealistic considering

the additional education that will be required of these two student classifications. Setting up barriers such as this is another method of curtailing educational opportunities for the average high school graduates.

(1) The University of the State of New York, "A Study of Industrial Arts Teacher Needs for the Period of 1963 to 1971," indicates that New York City needs 126 new teachers per year, and New York State will need another 230, making a total of 356 industrial arts teachers, while the number of industrial graduates in 1968 was 265.

(2) Denis J. Foley, Jr., "Handbook on Recruitment of Potential Industrial Arts Teachers," (Doctoral Thesis), September 1967. Of the 50 states, New York State ranks 20th in the number of teacher training colleges which offer an industrial arts degree.

Mr. Siegel is director of the Industrial Arts Department, New York City Board of Education.

Report to ACIAS

Herbert Y. Bell

I feel like addressing you this afternoon as confused industrial arts educators as far as the middle school program is concerned. This issue is something like a drop of oil on water – it flows in every direction and in as many colors. One cannot take hold of oil in water because it is in solution. This seems also to be true of middle schools.

I would like to preview for you the history of the committee. In actuality, it was formed as an expression of my concern at Philadelphia and met for the first time as a committee in Minneapolis. At that time the committee consisted of two members. This morning, we have twenty-three official members on the committee and many other participants from the audience. The committee was formed after surveying the council a year ago to determine those council members who were interested and knowledgeable. These people were further surveyed to determine if they could be in Las Vegas to meet in work session.

The reasons for development of a middle school are many. I think most of you are aware of these – such as the problem of integration, building needs, developing programs, getting along with less equipment and, in some cases, just getting on the band-wagon. The middle school concept, however, is developing very rapidly as will be indicated by my report and as I will report on Friday. An original survey in Texas, in 1967, reported 43 middle schools (7-8 grades) and today reported one district alone opening 43 next year! Middle schools are here and here to stay, gentlemen. The question is: Are we going to give them direction? Are we going to assist in determining the path that they are going to take?

Probably the oldest and best-known middle school is Fox Lane with its unified arts program at Bedford, New York. There are deviations from this, such as the one reported to the association last year – the related arts program at Madison, Wisconsin. Naturally, there are other deviations to this interdisciplinary approach, some, such as science, in combination with industrial arts, others dropping art and adding business education, and others keeping art and leaving out home economics, etc.

Another approach is the moving down of the present program, in some cases even to the sixth grade. Several programs report to me the involvement of all youngsters, sixth to eighth. However, this is not the case of many older programs. From this angle alone, the idea is worth mentioning and also seemed to be a general trend. The committee today dealt with these problems. We had reports from all parts of Florida, listened to a discussion of the Fox Lane program, Cleveland, Texas, Indiana, Washington, West Virginia, and of the problems confronting teacher education from Kansas. In other words, we had a nationwide feeling and exchange of concerns. Most of the committee members, as well as other interested individuals, contributed to the report. Actually, I don't believe the final committee is completely made up of council members; but I don't believe it to be of utmost importance, because the problem is large enough that we must combine forces if we are going to find solutions to the problems presented. Before we are through, we will need all the help we can get.

The committee decided on the following recommendations:

(1) The problem is extremely urgent, one of the two urgent problems facing industrial arts today. They both deal with relationships – the first industrial arts to vocational education; the other, the relationship of industrial arts to general education as it is applicable to the middle school concept. Guidelines are needed now. The committee felt that a year from now is too late.

(2) It was recommended that since we have just published a guide, perhaps the whole council should turn its attention to middle school.

(3) We should, perhaps, deal with middle school not just by itself, but as a part of the total problem of organization of all grade levels – scope and sequence.

(4) The committee wondered about the possibility of establishing regional meetings in the fall in order to get the feeling and recommendations from the various regions. This was recommended over an entire committee meeting. The committee felt strongly, as I have often expressed, that if we don't do the job, someone else will do it for us. This observation is confirmed if one reads middle school literature. There has been only one article written outside of the unified arts report by an industrial arts educator. All the rest of the literature that has been written is authored by administrators dictating both facilities and program.

(5) The committee felt there was a real need to identify just what education is, what it is for, and where we fit into the total picture. This has never really been spelled out.

(6) The committee felt that we should include the other councils, particularly teacher education and elementary education. A lot of direction seems to be coming from the elementary level and we need to understand their emphasis. Naturally, any change in program should be reflected in teacher education if we are going to find staff available to implement the recommended changes.

(7) The committee felt that the problem was important enough to be dealt with by the entire AIAA. Perhaps an interdisciplinary approach would make an excellent convention theme.

(8) The final recommendation is that we should prepare as soon as possible a condensed guideline to be forwarded to all supervisors.

Dr. Bell is from the Office of Public Instruction, Olympia, Washington.

aciate
general session addresses

The needs of disadvantaged youth: Implication for industrial arts

Frederick D. Kagy

One of the most timely subjects in the field of education today is the role of the schools in the teaching of the disadvantaged. The chairman of the program for the Council chose for his theme "Industrial Arts for the Inner-city Schools: Where the Action Is". He probably should have changed this title to "Where the Action Better Be".

So often at conventions and meetings the industrial arts teacher is confident that his area (industrial arts) will be the answer to the problem at hand. I believe that this problem – teaching of the disadvantaged – must be a total school commitment from all areas of the curriculum. Anything less than this will mean failure of the program. We must have success with this program or it will be disastrous to the public school program and even to the country. If educators do not develop a program to get the job done, other agencies, possibly private corporations, will be assigned the task.

What are some of the reasons that the schools find themselves in this dilemma? What has caused us, as a nation, to have so many persons in the category of "disadvantaged"? The answer to these kinds of questions can be a simple statement, but the answer is complex. Technology advancing at a rate faster than sociology is a simple way to answer the question. Technology advancing without regard for the social implications would be the complex answer. We do not have the time to develop these theories in their complete form, but let me highlight some.

In a subsistence society, few of our problems existed. Each day man was barely able to eke out a living. Each day he provided for tomorrow. Agricultural technology developed, and man was able to produce more food than he needed, freeing some men to pursue other specialties. This group of former farmers was able to produce articles which people wanted and needed for a better life. Technology was responsible; it was good. As people demanded more and more, technology and the factory system produced the goods. Technology was making the better life possible. It was also changing the living patterns, but not enough at that time to cause serious problems.

Agricultural technology continued to advance. More and more young people left the farms and moved to the cities. Farm subsidies programs, especially for cotton growers, moved many more poor whites and blacks into the cities. The city dwellings in older neighborhoods were divided into smaller units to hold more families. Highway programs allowed those with good credit ratings to purchase homes in the suburbs. The highways provided a means for them to get to work quickly. Good highways also allowed industries to move away from the central city. This coupled with a declining public transportation system made it harder and harder for the poor to get to work. The cities, with a declining tax base, found it difficult to keep up their educational buildings. Teachers did not want to teach in the old buildings, the ghetto areas. With work harder to find and in many cases impossible to get to, the feeling of defeat had set in. The background of the families, the parents' lack of education and the schools pushing to make everyone a potential collegian – all contributed to the dilemma. Technology which was giving many the good life was causing for others just the opposite. Technology was actually widening the gap.

As the technology improved, many of the entry-type jobs disappeared. The remaining jobs became more sophisticated and required persons with better schooling. This condition, in a nutshell, has produced the problems that we face today. Man was able to change his technology rapidly, but he did not stop to think about the social problems.

We have reached a point in time where all technological change is not necessarily good until we take into account the sociological consequences.

I hope this brief background reviews for you some of the ways and reasons our inner cities have become so densely populated. We should also take a look at some of the problems or difficulties faced by education and teachers in finding solutions for these problems.

The first problem I will call the communication gap. The words we say usually have a totally different meaning to the person on the listening end. The words used on TV and radio to describe a product do not produce the result; they also make the listener distrust all verbal response. The background of the talker and the listener can be totally different. This is especially true of the uneducated and the poorly educated person from the deprived area.

Teachers must recognize that students from these groups have not become articulate in the same language used by the teacher. They live, and guard their identity, in a culture with a language as different from that of middle class society as that spoken by a person from a foreign country.

This group uses a monosyllabic, but highly expressive, language that makes use of words such as grease, man, fuzz, finger, hit and turf, with meanings and implications totally different from our dictionary meanings.

So often the teacher of this group will follow the mistakes of the early missionaries and look upon this different language as barbaric. The teachers will have to learn to accept this as their students' native tongue and use English as a foreign language. While this problem is more acute in the elementary classes, this same language barrier and communication gap will carry over throughout their school career.

Problem two is in the area of attitudes. Middle-class America has a very high degree of achievement motivation, a strong desire on the part of the individual to achieve. The achievement motivation may be for intrinsic satisfaction or extrinsic rewards. This behavior comes from the parents of this group, who put high value on achievement. Excessive rewards and/or punishment will also produce undesirable behavior in the children, but that is another problem.

In the culturally-deprived family, there is little evidence that reward or punishment is given for achievement or the lack of it. With this type of background there is usually very little desire on the part of the ghetto student to achieve.

He sees his elders and his contemporaries having little success and little opportunity to improve their situation in life. He will come to expect the same kind of life for himself. This develops a very low level of aspiration. He sees the success and affluence around him and does not understand why he can't be part of this action. He feels society does little for him, and, because of this, he feels justified in taking matters into his own hands. He develops a negative attitude toward society. The school represents society and the teacher the representative of authority. The school then becomes an instrument upon which he can turn to relieve his frustrations.

A third major problem area is the changing nature of work in our society. An American's occupation is the most important source of his identity. "Who is he?" – most often means, "What does he do? What is his occupation?" A man is more than his job, but the occupational label enables many people to place the object of their inquiry within the occupational hierarchy and along a scale of educational attainment.

Little wonder that many well-paying jobs are not filled because of the social stigma. Down through history man has been taught that work provided him with the psychological satisfactions he needed – the assurance that he was contributing to his society. Work was a satisfying experience, and man's needs were met.

Today there is a decline in the dignity and the personal significance of the kind of work called for in many occupations.

On many assembly lines the one unifying force among the workers is the hatred of their work. They have contempt for what they do and are ashamed of their inability to earn their living in a more satisfying way. These workers are untouched by the planned recreation, rest periods, free coffee and retirement plans.

The bulk of the world's work consists of activities that permit little intrinsic involvement or feeling of commitment. But our schools still tend to stress the old ideas of the great satisfaction the person will receive through his work activity.

When this satisfaction does not take place, the worker becomes disgruntled, his self-image is destroyed, and he holds his employer and the company in contempt.

Now that we have identified some of the problems that make teaching the disadvantaged difficult, we can take a brief look at some of the ways industrial arts, along with the other areas of the curriculum, can contribute in a positive way to improving the school offerings.

One of the first things we will have to do is select teachers who believe that disadvantaged children can learn and succeed in school.

In a study of how a teacher's behavior toward a child is influenced by his perceptions of what guides, directs or causes a child's behavior, the findings indicate that if a pupil does poorly on a task, the teacher will tend to perceive the cause of this performance as internal to the student and attribute negative characteristics to him (low IQ, low social class, troublesome). If the student does well, the teacher usually attributes the positive characteristics to himself (I did a good job; my lesson was well prepared).

The school curriculum must become relevant and deal with real-life problems and controversial issues, such as race relations, materialism, politics, consumer competency, job opportunities, urban living, work, labor and management problems, family life, etc. Artificially-contrived busy-work must be eliminated.

A. Harry Passow, in a paper presented at The Ohio State University, put it this way: "an educational program which will insure meaningful growth, provide a sense of attainment and accomplishment, help youngsters understand and face their limitations as well as their strengths, provide for healthy attitudes toward school and society, and generally turn the indifference or antagonism of the disadvantaged child into acceptance and understanding. This represents content...."

The curriculum, through concrete experiences, should encourage students to form generalizations and concepts that, in turn, become tools for learning. From their many experiences with actual materials and processes, they will draw generalizations which we refer to as abstractions. The abstractions now take on meaning because the concept has been formed. New experiences can then be presented which encourage them to use these generalizations to solve their problems.

Too often we as teachers have made the mistake of expecting well-organized verbal responses to prove that learning has taken place. Given time and work in written and oral communication, the verbalization of the concept learned will take place.

Because of the communication gap, input systems other than just verbal will have to be used. The tools, machines and processes used in industrial arts activity are in many cases foreign to the disadvantaged as well as to students from middle-class America.

The problems that industrial arts teachers face with the slow learners are identical to those of working with the disadvantaged. We expect a student to know what we are talking about in a demonstration that requires mental precepts (visual recollection of objects) and mental concepts (generalizations of ideas) without giving the students the opportunity to have experiences which develop these. As the vocabulary of words with meaning develops, reading and the pursuit of additional knowledge will become a possibility.

The second problem area we discussed was that of attitudes, values or moral conduct. The teacher must accept the fact that the disadvantaged student has a different code of behavior. His values are different because of his experiences. The problem for the school is to build a bridge to help these students understand the cultural norms of the school.

Values and moral judgments can be taught as part of the curriculum, not in the sense of a model, but by introducing through the curriculum the content from which one can evolve values, by the study of such areas as the work order, the interrelationships of man, labor-management relationships, the growth of technology, collective bargaining, interrelationship of nations and technology in other cultures. He, the student, might then be able to re-examine his own culture with a certain objectivity. He might understand that each culture has its values and that values make sense.

He must learn that he has certain rights, but with rights go responsibilities. The goal is for him to see the need for values, attitudes and a moral code, in order to have a society.

The disadvantaged student needs more immediate rewards for his efforts. He does not have the tolerance level of the middle-class student, who can understand the long-range value of his education. The feedback to the student must be almost immediate on the progress he is making. The assignments and the experiences he has in the school must be relevant, and where possible relate to now.

The third problem area we spoke of was the changing nature of work. We must help all students understand the world of work. Some people call this the development of a career concept, others say the development of a "work model". While the work model is important for the student to develop, it is probably more important that we help him develop a "life model".

For the present adult generation, the idea of work still contains a moral imperative, and adults believe that the life of youth will profit if this value is preserved. It will not be for many if it is related only to employed activity. The nature of occupational activities simply will not permit it.

I am certain that the desire for a sense of personal purpose in life will need to be developed. This purpose, combined with the purpose for work, will help to make it possible to tolerate employed or compensated work even if it provides little ego involvement.

The person can get much satisfaction in non-compensated work – working for his church, youth groups, community, etc.

If industrial arts truly wants to be part of the action in this type of education, it will have to make the necessary adjustments. The teachers will have to decide what it is they are trying to accomplish. The objectives of this program will have to be defined in behavioral terms, verbal performance, physical performance and attitudinal performance. Then let us teach to meet these performance goals.

The content of industrial arts meets the criteria for relevant education. It should include the study of the growth of technology and of the social institution (industry) which our society has created to make use of technology. We should explore the processes, machines and materials that make up the man-made world. The students should have the opportunity to find out how our material goods are produced and what skills and knowledge are needed to be able to work and live in this endeavor. Occupational opportunities as well as the problems of the industrial society should be integral parts of the program.

The methods of industrial arts instruction also adapt well for the teaching of the disadvantaged. We work with things, the students do things, so that they can develop understanding about things and ideas. This develops the conceptual knowledge so necessary for all students.

The general environment of shop activity should develop the ideas of cooperation and interdependence of man to man, a system of attitudes and values. We have always been proud of our area for recognizing individual differences and actually doing something about it.

Our reward system is immediate; the student can recognize when he is making progress, since it can be seen. He is interested in what we have to offer if we keep current with industrial practice.

It will be up to us as professionals to eliminate the busy-work that has crept into our activity if we expect students to be anxious to learn our content.

I believe we have the content, the facilities and the methods to help the disadvantaged as well as students from middle-class homes. We just need to get with it.

Dr. Kagy teaches at Illinois State University, Normal.

selected addresses from the subject area and special interest sessions

curriculum development

Better articulation with the world of technology

Ronald B. Hall

Industrial arts is a fundamental part of the pupils' total educational development. The goals of industrial arts are to prepare students to live in a world dominated by technology.

Regardless of all other needs of industrial arts education, the paramount need is that of program organization. Dr. Burl N. Osburn, late director of industrial arts at Millersville (Pa.) State College, cited the need for program organization in his presentation to the Industrial Arts Association of Pennsylvania, entitled, "Industrial Arts is for Human Beings." Dr. Osburn proposed that we "conduct a serious study of purpose, curriculum and methods, with provision for continuous study and revision. This is perhaps the most urgent of all our needs, as well as the most difficult. We do not want uniformity, but we now have such a chaos of subjects, subject placement, offerings and methods that one cannot be blamed for being somewhat bewildered. Small wonder so many administrators say they don't know anything about industrial arts." Organization is the prerequisite for the establishment of a broad-based, forward-looking program of instruction for industrial arts education.

The scope of industrial arts education has been too narrow in recent years as we think of it in terms of the advancements of industry and technology. If one will pause for a moment and examine the vast reservoir of subject matter associated with technology, one can envision certain clusters or groupings of technological activities. These activities seem to display an adhesive quality which binds them together in much the same manner that can be witnessed in molecular structure. This molecular structure has a nucleus surrounded by any number of protons and electrons. The nuclei which develop from this vast reservoir can be identified as visual communications, power technology and manufacturing and construction. Around these nuclei revolve the infinite supporting technologies. It is possible at this level to identify a concentration of activities which will support the nuclei as previously set forth. This concentration of activity permits the establishment of a stable point of origin from which a program of meaningful content can be drawn.

This broad base will enable the industrial arts program to transcend the rapid pace at which technology is advancing. Consider the area of visual communications. Man has always communicated visually, from the time he first drew pictures in the sand and on the walls of his cave to the very sophisticated means of visual communications which exist today. Man first became a user of power when he first flexed his muscles, and proceeded to harness animal power, water power, steam power, electric power and atomic power. Man has been engaged in manufacturing and construction activities throughout recorded history. The production of simple tools, clothing and shelters led to the vast complex organizations of today which have changed man's very pattern of existence.

Man always has, is currently, and is projected to remain active in these broad areas of technology. To reflect this age of technology, industrial arts curriculum design in Pennsylvania is being projected from this broad base that will remain constant in years to come. The content can and will change to reflect the emerging trends of technology, but the broad base will remain to serve as an identifiable structure from which industrial arts is derived.

Every elementary school should provide maximum opportunities for boys and girls to interact with tools and materials, or, to put it another way, to interact with these things which are of technology. Industrial arts should not be considered an isolated subject at the primary and intermediate levels of the elementary program but rather one that contributes to the enrichment of the many areas of experience necessary for the growth and development of the child. It helps in the clarification of concepts encountered in many branches of learning. The activities associated with elementary school industrial arts center around technology and its relation to child, home and community. The self-contained classroom is the setting where these activities occur and become an integral part of the total program of instruction.

The three curriculum areas as mentioned previously are: visual communications, power technology and manufacturing and construction.

Like all other subjects in the middle school, industrial arts should adapt itself to the transition from the self-contained classroom in grade five to the more departmentalized offerings in grades six, seven and eight. Industrial arts should feature emphasis upon individualized instruction with separate experiences as much as possible, as the students move through the grade levels. Along with these experiences the primary emphasis should be placed on the factors that foster limitless growth and life-long learning.

Industrial arts in the senior high school should be consistent in every way with our quest for excellence in the total program of industrial arts education. The program should be developed as a multi-phase activity which provides opportunities for all segments of the school population. Opportunities for electing industrial arts should be extended to all pupils, regardless of their major area of academic specialization.

The primary purpose of the school is to provide learning experiences that will produce the maximum development of each youth so he may become all that he is capable of being. Activities within the three curriculum areas can be expanded and complemented by the addition of general research apparatus which provides for programs of test and experimental nature. Pupils may engage in a research project or a cooperative industrial arts-science program utilizing this equipment.

It becomes quite apparent that industrial arts curriculum content is moving away from the material-centered content of the past and toward a curriculum which is centered in the broad bases of technology. The supporting activities for these curriculum areas may be drawing, graphic arts, photography, power mechanics, fluidics, metals, woods, plastics, ceramics and/or any combination of the physical technologies that form a basis for an instructional area.

The curriculum design of Pennsylvania's "SEED for Progress" projects the area of power technology in terms of energy sources, working fluids, energy converters, transmission systems, controls and applications. Visual communications embraces the concepts of graphic representation, symbolism and color, and reproduction processes. The area of manufacturing and construction is thought of in terms of materials, manufacturing processes and construction techniques.

The articulation of industrial arts education with the world of technology will provide a place and a program for all ability within the structure of industrial arts education. The college-bound, technical and exceptional students can all find meaningful experiences which contribute to the development of intelligent citizens.

Mr. Hall works for the Department of Public Instruction, Harrisburg, Pa.

Overview of a pilot project

Larry T. Ivey

Introduction. The Elementary Industrial Arts Project in Bertie County, North Carolina, began with a Federal Grant under Title III, ESEA, in June of 1968.

The project was initiated by Bertie County school officials and funded by the United States Office of Education. The project has been in planning and operation one year and is expected to continue under Federal funds for two more years. The three-year budget will be in excess of $310,000.00.

This project marks a reinstatement of industrial arts into the elementary schools of North Carolina. We hope it will revitalize public interest and support in elementary industrial arts and will develop into a workable model for other school systems. This is the only Elementary Industrial Arts Project under Title III, ESEA, in North Carolina.

The first year we have 22 teachers and classes involved in the project. Enrollment in these classes totals over 650 students and represents ten (10) of the twelve (12) elementary schools in Bertie County.

Plans for the second year are to increase the number of teachers to 76, which will allow the project to reach approximately 2200 students in all elementary schools in the county. The second year should see the project with 50% of all elementary students participating in elementary industrial arts activity.

Second-year plans also include a program for elementary principals and supervisors. Principals and supervisors will be participating in the summer in-service education classes so that they will better understand the overall project as it relates to their schools and curricula.

Background. Bertie County is located in northeastern North Carolina. It is a relatively large county of approximately 25,000 population. It is a 100% rural county with 50% of its population involved in agriculture. Most of the remaining 50% depend upon agriculture either directly or indirectly for livelihood. There are no large cities in the county and very few cultural, educational or recreational facilities available for public use other than the public schools.

According to the 1960 US Census, the median educational level was 7.7 for residents over 25 years old. Approximately 70% of the families in the county receive less than $2,000.00 income per year. Limited economic and educational status of parents, the lack of appropriate educational and cultural opportunities and the dependency on welfare for economic security has led to confusion and frustration on the part of the student. The traditional elementary school program has provided no basis upon which he can develop a perception of his role in society or a value for continuing education. Consequently, upon reaching the maximum age for compulsory school attendance, almost 40% of the students see no need for further education and leave school.

Rationale. One possible solution to the existing problem of helping the pupil find his place in society is through a study of our evolving technological culture and its effects on all aspects of life. Upon the development of perception of his role in his technological environment, the pupil should be brought to the understanding that continuing education is essential. Furthermore, it should lead him to the discovery of the kind of education best suited to his needs.

Industrial arts has been recognized by administrators, principals, teachers and parents of Bertie County as being a necessary segment of the elementary curriculum. This local philosophy is easily supported by reference to such educational leaders as John Dewey, Fredrick Bonser, Mary-Margaret Scobey and one with whom you are all familiar, Elizabeth E. Hunt.

There are many reasons why industrial arts is important in elementary education and one of the more important is the contribution it makes by introducing students to technical concepts of design, instrumentation, tools, materials, processes and products and by allowing each student an opportunity to deal with these concepts in applying them to daily life situations.

Students in the Bertie Project have an opportunity to learn, at an early age, how technology influences the world around them. This learning experience is provided through field trips to industries, films and actual classroom activity related to industrial technology.

With the ever-increasing amount of knowledge, education is becoming more complex and requires that many areas of study be included in the curriculum. As the curriculum expands, many subjects or areas of study are being grouped or correlated. The correlation approach is being applied in Bertie County to implement elementary industrial arts into the present curriculum.

Teachers and coordinators are working together in developing curriculum materials derived from basic texts and industrial arts subject matter. Correlation is being applied in all areas of the elementary curriculum.

The correlation of industrial arts with basic elementary subjects is a direct result of a study conducted by Dr. William R. Hoots, East Carolina University, which gave positive evidence that elementary textbooks include many references to technology and industry. We have utilized the findings of Dr. Hoots' study to develop an elementary curriculum in industrial arts.

We are combining industrial arts with the basic curriculum in a child-centered approach with strong emphases on the child's view of life in our society. Technological material is therefore prepared and presented at the child's level of understanding and capability. Uppermost in the growth and development of the young child is the necessity for that child to feel that he can deal successfully with his physical and social environment. Industrial arts activities provide opportunity for the child to discover and develop competency in dealing with the physical environment.

Another very important reason for incorporating industrial arts with elementary curricula has to do with student motivation. We cannot motivate a student by our own actions; he must motivate himself from within. Finding the key to this intrinsic motivation has long been a problem of educators. Industrial arts may not be the whole key, but it is certainly doing an excellent job of "lock-picking".

By providing realistic physical activities appropriate for each child's ability and comprehension, industrial arts stimulates and generates motivation within the child. He is afforded an opportunity to apply his knowledge and problem-solving ability to practical situations which have important meanings to him as an individual. Students must be given the opportunity to interact with their technological environment if they are to develop to their fullest intellectual capacity.

It has taken centuries for man to realize that one individual cannot motivate another except through some application of physical activity. Past applications of physical activity have included such methods as the "hickory rod", a paint brush and canvas, or perhaps a musical instrument. Why not apply physical activity in the form of creative expression through activities more closely related to daily situations and future requirements? There is no legitimate reason for not applying physical activity which will have meaning to the person involved.

Industrial arts has the subject matter, sensitivity and means for applying physical activity in the classroom. The need now is to implement the program in the curriculum. Since elementary teachers have the professional background and understanding necessary to reach their students, they are the logical instruments to implement the teaching of industrial and technological concepts through physical activity in a physical environment.

Student interaction with industry and technology should not be withheld until junior high school or until the individual has formulated his conception of life and life's requirements. Psychologists now say that the early years of childhood are the years in which most learning takes place and many concepts are formed. Apparently there is no better place to teach about life and society than in elementary grades, where children are eagerly seeking knowledge and their curiosity about their world is at its peak.

The project in North Carolina is utilizing the talents and abilities of elementary teachers to implement industrial arts in the present curriculum. While this may not be the easiest method for teaching industrial arts, we are finding that it is a very effective method. Not only is it effective, but also it is very practical for our particular situation.

If we were to place one industrial arts specialist in each school, we would need twelve (12) such specialists plus a central office and materials center. Expenses for the latter approach would be a deterrent in most school systems. Also, where would we find enough specialists to go around? The teacher approach which we are developing is expensive only for the first three years. After the initial three years, elementary teachers will have the training necessary for correlating industrial arts with other subjects. They will still occasionally need assistance, which will be provided by one or two supervisors.

During the three-year orientation and training program, four (4) curriculum coordinators are employed to work in the classroom with the teachers. As each teacher becomes proficient in handling industrial arts activity, he is weaned of coordinator assistance and begins to take over the planning and conducting of all industrial arts instruction. The coordinator is then released to spend more time with those teachers needing extra assistance. It is expected that after three years' experience in the project, teachers will need specialized assistance on a very limited basis. This assistance would be provided by the two supervisors previously mentioned.

The in-service education program necessary for implementing the project in Bertie County, North Carolina, should prove to be workable in any school system in the nation.

Reactions to the project. There have been many reactions to the pilot project in North Carolina, but of most importance have been the reactions of students in the project.

Students of all grade levels are learning that group activity directed toward a common goal will achieve positive results more rapidly and more economically than can be realized by individuals working separately toward the anticipated goal. This learning experience is reflected in student comments and reports recorded after the students have been exposed to individual activity as compared to group activity. A similar reflection can be seen in reports written by students giving their reactions to field trips and films in industry.

Through studying industry and technology in the classrooms and observing industry and industrial processes on field trips, students are becoming more aware of industrial technological aspects of society and are gaining understanding of its relationship to their daily living. Anecdotal records and student reports reveal evidence that this awareness of technological influence is increasing. One example of this has been the realization by students in the project that a large percentage of the industrial working force is composed of women. Another example is apparent in student reports which recognize the need for constant retraining and up-grading of industrial personnel.

Coordinators and teachers have consistently reported that younger students are capable of manipulating tools and materials effectively when tools and materials employed are designed for use by small children. Performance and proficiency of small children tends to increase as they gain confidence in personal and group ability.

Project teachers report that academic interest and achievement are improving through providing technological experience for students.

Teachers and students express enthusiasm for working with manipulative activities, and student enthusiasm has been noticeably carried over into work with other subject matter areas. As activities become more closely related to classroom studies, students display greater interest in basic elementary subjects.

Reactions from parents and citizens has been positive and, as they gain more understanding of elementary industrial arts, their enthusiasm and support increase. Letters and comments from local citizens indicate a willingness to support industrial arts education in the elementary schools. Local support is necessary to any Title III, ESEA project, because Federal support can only continue for three years.

Evaluation. Project evaluation is an important, integral part of the total project. Our first-year evaluation had to be derived from teacher-coordinator reports and from reports by members of an evaluation team brought in to appraise first-year activities. This procedure was used for the first year due to the short time the project has been in operation.

Plans for future evaluation include the development of instruments to be used in determining student behavioral and attitudinal changes. Materials, procedures and analysis for evaluation will be planned and conducted with the assistance of Educational Testing Service, Durham, North Carolina. We also plan to use consultants and experts in the evaluation process. All the above procedures will be combined with anecdotal records and teacher reports to form a comprehensive evaluation of project endeavors.

Dissemination. If any program or project is to succeed, it must have the support of citizens as well as educators. A major goal of the Bertie Project is to secure that support.

Realizing the need for keeping the public informed of educational innovations or achievements, we have launched an extensive dissemination program to inform the people of the advantages of industrial arts in elementary education.

Dissemination efforts have included speeches, newspaper articles, visitations and television programs. Television has proved to be the most effective method for reaching the greatest number of people. Response to a thirty-minute TV program has been extremely positive, with respondents stating that they gained a better understanding of the project through the TV program than through any other media.

In closing, I would like to emphasize this: "Any industrial organization realizes that good advertising promotes product consumption. Elementary industrial arts must advertise if it is to continue in growth and development." You and I know that industrial arts has an excellent and much-needed program for elementary education, so let's inform the people, unify our efforts and put the program where it belongs – in the elementary schools.

Mr. Ivey is director of the Title III, ESEA Elementary Industrial Arts Project, Bertie County Schools, Windsor, North Carolina.

Action in elementary classrooms

George H. Hackman
Thomas L. Barrington

After studying equipment needs for the Elementary Industrial Arts Project in Bertie County, North Carolina, it was decided that the Stanley Tool Company's Mobile (portable) Elementary Tool Cart would best fit classroom needs. This cart is equipped with an assortment of hand tools specifically designed for elementary students. Each of the ten (10) elementary schools has at least one equipment unit in the school.

Other tools and equipment were needed to complement the unit. Storage space became a necessity when additional tools and equipment were purchased. The storage problem was solved by using the Brodhead-Garrett (EP6) Elementary Workbench. This bench is portable and has an excellent work surface with adequate storage space below.

In order to expose students to more realistic industrial technology, we have incorporated a number of small power tools into classroom equipment. We have found that these power tools – 1/4-inch drill, sabre saw, finishing sander and Dremel jig saw – are very appropriate for elementary classes.

The activities in the classroom, most of which stem from the textbooks, are used as a vehicle of the learning experience. There are five basic areas of industrial technology to which a subject might relate. These areas are: power, communications, transportation, construction and manufacturing. Many of these areas have been explored by the students this year.

In the 6th- and 7th-grade classes at one school, students had been studying paper and paper making. The students explored the idea of making their own paper. A field trip to a paper mill stimulated their interest by providing for them a realistic experience. They were given samples of the pulp, liquors, chips and different grades of paper. The students used the pulp to make their own paper. They developed their own techniques of making paper and were quite successful. This unit was an outgrowth of manufacturing correlated with their social studies.

Students at another school were presented with a double problem, and a single solution evolved from their work. They were studying electricity in science, and the states and capitals in social studies. With aid from the teacher, they developed a programmed teaching aid in which they utilized electricity and electrical circuits to achieve their goals. They used 1/2-inch plywood with the names of the states and capitals printed on them. They drilled holes and inserted small bolts. Then the arduous task of wiring the state to its corresponding capital took place. To complete the circuit, a 1.5-volt bulb, a 1.4-volt flashlight cell and two probes were connected in series to complete the circuit. This solved the problems nicely, and the students have used the board effectively.

A second-grade class has been studying the uses of electricity. They found pictures of items using electricity. To follow up their study, our low-voltage DC power supply was put into operation. The students experimented with it by hooking up several toys, and then they experimented with lights. As a continuing activity, these students have constructed a small house and are planning to wire it with lights and a door bell as their wiring project.

Rocketry is fascinating to the students. A fifth-grade class has seen films on rockets and experienced the actual launching of a solid-fuel model rocket. This was an enjoyable and educational experience relating to science.

Social studies and a study of North Carolina has spurred interest at several schools. The students have drawn maps of North Carolina on 1/4-inch plywood and used a color distinction for the three regions of North Carolina. The plan called for a parallel set of lights to be used to highlight the industrial areas of North Carolina. The students used symbols to illustrate the types of industry. The students gained experience in simple electrical circuits, as well as the learning involved in the research on North Carolina.

Students at the junior high school decided to see how much work was involved in hand-crafted wood products. This was a part of their tool-material orientation and exposure to the ardor of the woodworking processes.

Students in language arts have studied the tools of communications. One sixth-grade has constructed telegraph systems. They did research into the telegraph, then began their construction. They wound their coils for the electromagnets, cut the bases, cut the metal and finally soldered the finished product.

Many students have constructed teaching aids for their teachers. One such demonstration model was the construction of the electron orbit around the nucleus of an atom. The teacher says that this model works nicely and the students can visualize the thought that is being conveyed.

Students in the 8th-grade class were studying the difference between mass production and custom production. They mass-produced flower pot stands, using stations for each operation. They developed jigs for their ease and operational necessity. Their results were compared with an individual production project. The students found that mass production was easier, faster and more effective. These students took a trip to Stanley Power Tools in New Bern, North Carolina, to see the actual effects of mass production.

Students in a fourth-grade class, in studying safety, decided to make their own traffic signs. They did some research into the shapes, colors and materials used in highway signs. Then, they constructed their own signs and did their own art work. It was interesting to see the enthusiasm with which these students worked.

After a field trip to a North Carolina dairy, fourth-grade students decided to compare homemade dairy products with the manufactured dairy products. They made ice cream, butter and cottage cheese. Only the ice cream was better when homemade. They realized the work involved in making these products and how industrial technology has allowed these products to be made in such great quantities.

It is interesting to see how students solve their problems. More often than not, they need someone to help them with their work. Two students, working on a cutting board, worked to center a hole in the board. Once this was done, one boy held the board down, while the other boy drilled the hole. They also work nicely with planes once they have been given a chance to become familiar with them. One student seemed to be particularly proficient with the plane.

Even the second-graders have become familiar with the effects of mass production. After the students had gained some experience with the tools and materials, they wanted to make something by the mass production method. As a manufacturing activity, the teacher and students decided to make a note pad holder and note pad. Several stations were set up where the students were to perform each operation. The design was traced on 1/4-inch plywood. It was sent to another station to be cut, then to another to be sanded. Another station painted the design. As these operations were being performed, the note pads were being made on a different line. They were padded, drilled and sent on to the final assembly point. A jig was provided so that the holes could be accurately located. The students assembled the note pad holder by putting the hooks in the wood and then by placing the note pads on the hooks. This was an uplifting experience for the students.

Pottery was introduced in one fifth-grade class. They studied how pottery is made and then made some small pieces using non-kiln dried clay.

Students in another fifth-grade class, in studying about communications, used screen process printing to learn about one phase of the printing industry. They put their own ideas on the paper, cut out the design and printed it. Through their individual research, they learned the history of screen process printing and its relation to modern-day printing production.

Students in a sixth- and seventh-grade class, in studying about clothing, decided to delve into the textile industry. They first made a crude loom and did some very simple weaving. They refined their process and, by injecting their own techniques, got a better and faster weave. As a final step, they wove some placemats. They went on to the dyeing process, and a field trip to a dye plant revealed many important facts about textiles to them.

Several classes have had the opportunity to study in communications, the radio and its effect on society. There was considerable research into the radio, and the students came up with the diagram for a crystal radio. They found out how this type of radio works. Soldering techniques were hard to come by, but they managed finally to make a decent joint. All of the radios that have been completed are very satisfactorily operable. Several of the better-constructed radios have been able to tune two stations with decent selectivity. (The nearest station is 12-14 miles from these schools.)

One 15-year-old sixth-grade student, normally considered by his teachers as being withdrawn and of low mentality, came to life on this project. When we discussed the construction of a crystal radio, we must have aroused an interested part in him. He borrowed an encyclopedia and came back to school the next day with his "version" of a crystal radio. He had purchased no materials, but salvaged what he could from an old radio. When tracing his circuit we found that his connection wiring was right, but that he had used a resistor instead of a detector. It did not work! Under supervision, he built another radio in the class. This radio did work. In fact, it had far superior sensitivity compared to the other receivers in the class. His teacher reports that this student now takes an active part in all class activities. Could it be that school has been nothing for him until now?

The idea of making lighted maps has been popular with the students. One particular student learned about electricity and did a study of South America at the same time. He cut an outline area of South America from 1/4-inch plywood, painted the countries in and then wired 22 lights in parallel to denote these countries. Now as each region is studied, a light bulb is put into the socket to denote this country. This project was designed, developed and constructed by this one student.

A fifth-grade class, in studying power, has been mass-producing small electric motors. They have set up jigs at each station to enable them to work faster. Along with this work, they visited a power plant (to see where and how electricity is generated) and an electric motor rebuilding plant, where a motor was completely rebuilt for them, showing every step and its relationship to their electric motor assembly.

Students in one sixth-grade class are constructing a gigantic "walk-in" camera. This camera is used not only as a device to make the negatives, but also as a darkroom to develop the negatives and make the prints. They will study photography and actually make negatives and prints inside the camera. The lens is mounted on a wall of the camera, and the object to be photographed will be outside. It is so constructed as to allow it to be dismantled to be transported to other schools for other use.

In another case, students were studying about colonial America. They made a model of a colonial village showing the different types of buildings and studied the manufacturing that was carried on at that time. The students gained an experience in using the tools and were able to relate the manufacturing of colonial times with the manufacturing of today.

Kindergarten students, when given an opportunity to work in a tool-material environment, display enthusiasm, interest and discipline in working with the tools and materials. Kindergarten students have effectively used the Dremel vibrating jig saw, and many hand tools in making jig saw puzzles, Christmas tree ornaments and other items. The ability of the kindergarten students surpassed expectations when they designed and constructed a table and four chairs for use in their classroom.

A most rewarding aspect of the project has been the realization of the elementary teachers that their students possess the ability for dealing effectively with a technical learning environment.

Messrs. Heckman and Barrington are Project Curriculum Coordinators for the Elementary Industrial Arts Project, Bertie County Schools, Windsor, North Carolina.

Developing a state curriculum guide in electronics

Alvord H. France

As you might already know, the State of Arizona is somewhat sparsely populated over much of its area. The state's 1.3 million population is distributed over approximately 113,500 square miles, thus giving it an average population density of about 12 people per square mile. However, that figure is almost meaningless when one considers that over 700,000 of that population reside inside a 25-mile square centered about the City of Phoenix, and another 250,000 reside in the Tucson area. As you can visualize, there are a number of smaller cities and towns in the more remote areas of the state.

This far-flung remoteness tends to impart a sense of isolation and points up the need of assistance in developing an identity with other parts of the state. The metropolitan school districts have enough industrial arts teachers within a small geographical area readily to assemble a quorum for discussions or to maintain some degree of uniformity in a given subject-matter field. However, the more remote one- and two-man departments would have difficulty in taking advantage of such "meetings of the minds". One primary purpose of the state curriculum guide is to provide some form of guidance to these smaller outlying districts. In addition, men in the field expressed a need for an appraisal and expansion of existing electricity/electronics programs within the state.

It is not my intention to present the Arizona Industrial Arts Curriculum Guide in Electricity/Electronics as a model of perfection. Nor is this the time or place to evaluate such a guide as to format, content or sequence. Rather, I would present the events leading to its final publication with the hope that some of our experiences might be of value in easing the "birth pangs" of similar action on the part of other groups.

There was a large degree of cooperation, considerable clarification of objectives and hopefully some conformity of similar programs as a result of our concerted effort in Arizona. Possibly some of the points just mentioned might be applied to comparable action on the national scale.

Electronics is a comparatively new area in the industrial arts programs in our state, with only a few of the school systems having offered it ten years ago. Many of the smaller departments would require some form of shared time and/or area arrangement due to staff and space limitations. Since the field of electronics is quite technical, many industrial arts men who have had only a minimum background in electronics were loath to "take it on" in addition to their other activities. They were probably somewhat intimidated by the aggregation of electronics training systems available with all of the different claims and counter-claims of the various systems and equipment companies. The relatively high expense of equipping a complete electronics laboratory gave many men in the field and their administrators pause in contemplating a "new" area that is so different in many ways from the more traditional areas of drafting, woods, metals, etc. Finally, the expansion of the electronics industry in the state imparted a certain urgency to the feeling of need for offering more and better courses in electronics in the public schools.

The difficulties just cited, to name a few, gave rise to some serious thought on the part of a number of our industrial arts men as to the best way out of the dilemma. It was decided that developing a curriculum guide would be the logical first step in alleviating some of the problems facing us in the teaching of electronics. The fall of 1966 saw a group of teachers interested in this area meet for the purpose of working toward such a guide.

Excerpts from the foreword of the guide itself, as written by J. R. Cullison, State Director, Vocational and Technical Education, State of Arizona, serve best to describe the development of this publication:

"This guide is the first in what will hopefully become a series of guides in industrial arts. It was developed through the cooperative efforts of many industrial arts teachers.

"The project was coordinated by Mr. William Anderson, State Supervisor of Industrial Arts.

"A total of 44 volunteer teachers was involved in developing the guide. Subcommittees representing both the intermediate and high school segments of the curriculum worked as a team to provide articulation and coordination between the offerings at the elementary and secondary level. A series of meetings were held during the 1966-67 school year and climaxed by a five-day workshop at Westwood High School in June, 1967. The workshop was funded from Title V, PL 89-10, the Elementary and Secondary Act of 1965.

"A supplement is planned to be distributed at a later date. It will include suggestions for enriching and embellishing the industrial arts program of instruction, including suggested equipment, commercially-prepared units of instruction, and other teaching aids."

The stated objectives of the curriculum guide are typical of others in industrial arts, namely: "(1) to provide a suggested course outline with student activities, teacher activities and instructional aids which will be useful in organizing and teaching electricity-electronics classes in industrial arts; (2) to describe the purpose and content of the electricity-electronics courses; (3) to serve as an aid in coordinating existing programs in the intermediate and secondary schools throughout the State of Arizona; and (4) to provide a suggested curriculum that will serve as the foundation for electricity-electronics curricula in trade and industrial education, technical education and engineering."

In retrospect, our group seems to have been faced with four major problems in developing this curriculum guide. First, and possibly foremost in the minds of the men involved, was the thought of having something forced on them. The small remote districts were somewhat distrustful of the larger urban districts' taking over the project. Some expressed the hope that there would be allowance for individual district characteristics and needs. Not a few wondered if the final result would be rigidly enforced on the state department level. These negative aspects were met head-on with positive assurances early in the agenda, and everyone involved proceeded accordingly.

A second problem faced had to do with the scope and sequence of the curriculum contents. The four main subdivisions of the guide (Exploring Electricity/Electronics, General Electricity/Electronics, Electronics and Advanced Electronics) were deliberately divorced from any specific grade levels. In this way, various schedule combinations might be arranged by the individual schools. Prerequisites were minimized so that the courses would be available to the largest number of interested students. The curriculum was drawn up to emphasize general background information and skills rather than specific vocational activities. The group felt it better to err on the side of saturation rather than minimization in the matter of scope of the guide. In this respect, an individual program could be developed by extracting sections from the total guide rather than by expanding a meager skeleton outline to fit the needs of the school.

The group was faced with a third problem in the area of methods of instruction as they would affect or be affected by the guide. Viewpoints in this area varied from the strictly project-oriented approach through the laboratory systems to the abstract math/engineering-oriented approach. Since the guide was intended for universal usage within the state, the group avoided any "slanting" of the material so that it could be readily adapted to any feasible system of presentation.

Finally, the problem of equipment and teaching systems was considered. It was decided that our first major objective was to present a group-developed outline that would serve as a starting point in upgrading existing programs or as a guide in starting up new programs. No attempt was made to standardize programs within the state. It was the opinion of the group that a given lot of electronics programs around the state would ultimately exhibit some degree of similarity without being stereotyped. It was strongly agreed that full latitude be allowed for ingenuity on the part of instructors in the area and that the door should always remain open for future improvements to the curriculum. Therefore, no recommendations were made at this time regarding equipment and systems, but the matter was held for future treatment.

Incidentally, there were some fringe benefits that accrued from this developmental activity. The continued interest on the part of the forty-plus men in the field was most refreshing. The group was representative of a broad cross-section of the districts around the state as to size, type and location. The monthly general meetings at widely-scattered schools throughout the year enabled the group to see some of the existing facilities and conditions. This activity was entirely voluntary, with no remuneration for time or travel except for the final workshop. During the course of the meetings, a certain "esprit de corps" developed within the group, and there was a noticeable softening of earlier feelings that might have made cooperation and progress difficult. Further, it seemed more probable as the project developed that greater use would be made of the end product since a fairly large representative group of electricity/electronics instructors had a part in its development.

In sum, we in Arizona feel that we have developed a curriculum guide (I emphasize the word guide) in electricity/electronics that can be used in part or in whole by industrial arts departments around the state with benefit to the overall program. We feel fortunate that we have a cooperative state supervisor of industrial arts whose aim is to assist rather than to dictate. While the curriculum guide is not unique – in fact there are several sections that are quite similar to other state programs – it is still a "home-grown" product. The very fact that this instrument was developed by a relatively large group of local men – men actively engaged in the teaching of electricity/electronics and conversant with its problems – makes it of special value to the rest of us in the state. Finally, this guide in its present form is intended to be only the first step in a continuing attempt at keeping abreast of the expanding technical aspects of our society.

Mr. France teaches at Westwood High School, Mesa, Arizona.

A national electricity/electronics curriculum—do we need one?

Robert R. Witt

Technology has changed the frame of reference in all segments of our society. Instant communications, miracle fabrics, multi-means of transportation and instant foods have amazed us as adults. The young people of this world take all of this for granted, yet will demand more,

Education has always been accused of following "yesterday", instead of being ahead of "tomorrow". Economists inform us that by 1975, three-fourths of the workers will have experience with products not yet invented; that each high school graduate will change his vocation twice in his lifetime; that twenty (20) percent of the workers will have been trained for obsolescence; and that only six (6) percent of the jobs will be for unskilled labor.

It should be apparent to all that the great strides that we have made technologically have been in part the result of use of electricity-electronics. But how up-to-date are our electricity-electronics curricula? When was the last time your electricity-electronics curriculum was modified to meet the changing times and the speculative future?

It is an awesome challenge and task to maintain a responsive curriculum that recognizes and uses new media, provides for the readjustments of teaching and learning, and stimulates the student for increased knowledge and experiences. Thus, the vast field of education and, more specifically, the segment of electricity-electronics must be constantly changed to enable us to teach for "today". We must strive to maintain a current curriculum, even if it amounts to minor changes each year. This, of course, means that some instruction may be relegated to a lower grade level, de-emphasized, eliminated completely as no longer valid; or up-dated as a result of current information, professional preparation or acquisition of new methods and equipment. Curriculum change is pervasive and must be done if we are to make any progress. However, any changes in direction or emphasis of the electricity-electronics curriculum must come from within because of the pressures from without. The electricity-electronics educators must instigate, perform and evaluate any changes in terms of student interest, knowledge and salable skills. In quest of direction, one must consider the several approaches, namely, projects, service-repair and technology.

In the traditional project-centered program, the student learns component identification, technical facts of circuitry operation, manipulative skills, cost estimation, construction techniques and troubleshooting procedures that should be transferable to an occupational endeavor. But does your curriculum teach him enough?

A service-repair program would be desirable, practical and supportive of problem-solving techniques and knowledge. The application of such a program could result in meaningful activities of repair and maintenance on a host of modern electrical or electronic appliances. As the appliances have become more numerous and more complicated, the consumer must rely upon competent and skilled servicemen. With some of the present programs, are we providing any competencies toward the development of future service-repair technicians?

The technology program is a search to provide academic respectability to industrial arts. The emphasis upon ideas, problem-solving, research and development techniques often relegates the program to high-ability technicians or engineering aspirants.

Each of these approaches has its merits and should receive its full value and time in the instructional program. At best they would provide for flexibility, rather than for education or training for obsolescence.

While there is neither a national curriculum nor a Federal office dictating what is to be taught and how, there is a shift away from the materials-project-oriented industrial arts, to programs that offer and fulfill more adequately the educational needs of students and the demands of industry. This shifting has caused concern over the need and development of a national industrial arts curriculum. Groups and individuals have voiced each side of the debatable question.

In favor of a national electricity-electronics curriculum, one might argue the merits of the following points: (1) Prevents a local fixation of electricity-electronics curricula; (2) provides a single set of guidelines for teaching theory and manipulative skills; (3) provides a common content for today's mobile youth who may have been born in Pennsylvania, educated in Arizona, but will seek employment in California; and (4) would provide coordination among junior, senior and post-high school electricity-electronics courses and student goals.

Against a national electricity-electronics curriculum, the following points have been raised. They are: (1) A stereotype student or future worker could evolve; (2) a rigidly-defined program of electricity-electronics cannot meet the needs of the varied types and abilities of students, nor allow for their specific needs or interests; (3) future changes would occur by dictate only; and (4) a national electricity-electronics curriculum would not allow for the many variables if local needs are to be given preference.

At the present time, I prefer the state and local curriculum guides to provide electricity-electronics course content, rather than a national curriculum guide, regardless of the heretofore-mentioned points, some reasons being that: (1) Local and state curriculum guides can reflect published national trends by continuous evaluative efforts; (2) the educator in the classroom will readily accept, utilize and evaluate the curriculum guide if he has made a contribution towards its implementation; (3) local and state supervisors generally know the pulse of national trends, and thus are in a position to offer information and guidance; and (4) the alert teacher does not need a step-by-step nationalized curriculum, just guidelines and administrative support for local and state needs, flexibility, content and professional improvements.

The inclusion of industrial arts education in the National Defense Education Act, and its continuance in the Education Professions Development Act, has given a tremendous boost to the prestige of our profession. The Act has provided funds for the many fine institutes in industrial arts throughout the United States. Why could not this same idea be utilized on the state level, using state funds or a combination of state and Federal funds to integrate the many local plans into a state-wide program of updating and coordinating the electricity-electronics curriculum? The resources and services of industrial agencies or personnel, service technicians and outstanding educators could provide the pulse beat for the types of programs offered and the extent of their involvement.

No electricity-electronics curriculum, whether by local, state or national curriculum committees, should be dictatorial or all-inclusive with its content. The content should be flexible and the objectives clearly stated. The curriculum guide should: (1) Serve as a suggested outline with student activities, teacher activities and instructional aids; (2) aid in coordinating existing programs in the intermediate, secondary and post-secondary schools; (3) provide a suggested curriculum that will serve as the foundation for electricity-electronics curricula in industrial arts teacher preparation at colleges and universities; and (4) be readily modified to meet the changing times and student needs.

The real issue of change is with the classroom teacher. He is the one directly involved with re-education or adaptability. Whatever is done, he should be made to feel that his efforts and contributions are important and worthwhile. The creation of a local or state electricity-electronics committee or council, as formed in some states, may be the catalyst. Such a council could: (1) Implement or suggest changes in curriculum; (2) arrange up-to-date seminars, workshops or professional courses conducted by industrial management, engineers, or leading educators for the exchange of directions, expectations, job requirements, available opportunities, technical knowledge or procedures and improved cooperation between industry and education; (3) provide a system for exchange of topics or techniques of special interest to electricity-electronics instructors; (4) arrange for field surveys of research, manufacturing and service facilities; and (5) advise or assist in the development of new electricity-electronics programs.

I do not presume that this presentation is detailed enough to be used for decisive purposes. There will always be differences. However, can the many facets of industrial arts electricity-electronics be successfully channeled into a standardized program? With a strong up-dated reflective state electricity-electronics curriculum guide, is a national guide necessary? The question remains open.

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The supervisor's role in implementing curriculum change

Kenneth L. Schank

Of prime concern in these days of rapidly-evolving educational change is the question of what is the real role of the industrial arts supervisor in implementing curricular change. Assuming the proposed change has an educationally strong basis, what procedure could be followed by the supervisor in implementing the program at the appropriate levels?

There are a number of factors to be considered before a plan of action can be instituted. A primary consideration, that of the selection of process, is fundamental. Because procedural plans are important to school administration, faculty and the community, a decision must be made as to whether evolution or revolution is the best approach. Evolution seems to be the safest, most conservative approach, so the plan offered for consideration in the role of the supervisor in curriculum change will follow six guidelines.

The six points, which will be discussed and enlarged upon, are just one set of guidelines which the supervisor could adopt as he asserts a leadership role. They are: Research, development, demonstration, dissemination, application and evaluation. Added to these steps must be a procedural device which, borrowing from our space exploration program, should include a situational system of "Go," "Hold" and "Abort."

(1) RESEARCH: A systematic approach to self-evaluation:
   (a) What do we have in our program(s) now?
   (b) How do children best learn?
   (c) What are we doing to meet the needs of children in our community? Our state? Our nation?
   (d) What areas commonly found in good industrial arts programs are we omitting?
   (e) What short-range plans are already in process?
   (f) What long-range plans are already in process?
   (g) What national trends could influence our program?

As we survey the content of our various industrial arts offerings, we should ask ourselves: "Is this program the most feasible way for students to acquire content?" Maybe our situation is even worse than we thought and we are further back in time and are not even providing an initial program that reflects our modern-day industrial-technological society. Another question which might help to establish evaluative criteria is: "Is this the soundest way for students to retain the concepts we seek to teach?" In other words, are we leaving the important fundamental knowledge to chance, without an opportunity to reinforce these concepts through immediate application? Should we be running "talk shops" with no meaningful activity, or are we operating "activity shops" with little thought for the relevance of skills and the world of work, or, considering further, can we recognize a wholesome balance leading to total learner growth? Do we have any short-range or long-range revisions in progress at the moment? Too often a fragmented approach is started without consideration for the total scope or sequence and is thus entirely unrelated to curriculum unity. Research should also uncover national trends in education as they are related to local pressures. Some examples might be teaching media, teacher shortages and Federal monies, which might be influencing local curriculum attitudes. Some other strong forces influencing local education might include: "New" content, "new" objectives and organizational changes, such as modular or flexible scheduling.

(2) DEVELOPMENT:
   (a) Who is to develop curriculum?
   (b) How is the program to be built?
   (c) What is our manpower potential?
   (d) What levels of instruction will be involved?

If a state-wide approach to developing and implementing curriculum for industrial arts is to succeed, all levels of administration, supervision, teaching and teacher education must be involved, not passively, but actively. A state-wide steering committee is suggested. We make jokes about committees and scoff at the democratic process; however, a small group can be objective and perform a clearinghouse service in expanding industrial arts curricula. Who should be on the steering committee? Probably the state consultant for industrial arts, a city supervisor, a department chairman, several teachers, a superintendent and a principal. The industrial arts knowledge and concepts will come from the professionals, and the superintendent and principal will be the check and balance, serving as sounding boards and adding a note of authority to the group. The duties of this group will be of the advisory committee type, with the supervisor assuming a leadership role to keep things rolling. The working committees will have to be dedicated workers who can set, and keep, timetables. They have to be able to withstand shock, the kind that comes with frank activity on a professional level, and after seeing a cherished item shot down, bounce back with alternate proposals. A total program should provide a smooth sequential path from junior through senior high school. The American Council of Industrial Arts Supervisors suggests that the junior high program (grades 7, 8 & 9) should include experiences of an introductory or exploratory level in drafting, electricity/electronics, graphic arts, metals, woods and industrial crafts. An introduction to power mechanics could be considered as a good basic course for ninth graders also.

Assuming the junior high schools have a limited program, what can be seen in the six or seven areas listed above which could be adapted to an expanding curriculum? Another question might be whether new offerings could be fitted to unit shops or general shops re-oriented to accommodate them. Could a present curriculum in industrial arts be broadened to include an active relationship with mathematics, science, language arts or social studies? Expansion to correlate with these areas will provide opportunities for students to discover and develop their aptitudes, abilities and interests. Provisions should be made for the development of skills and creative activities, through which a better understanding of our technological society can be gained. A progress checklist should be developed for the committee to use in meeting deadlines and goals. A checklist is important as to what the status is in junior high as well as to what the progression is as far as senior high school status. Are there opportunities for students to study in depth? Are there opportunities for research and experimentation? Are industrial processes simulated? What emphasis is placed on planning and design? What about consumer knowledge? What are the expected behavioral changes in boys and girls? The supervisor's role as an educational leader will be in the making of decisions and the setting up of a workable policy.

(3) DEMONSTRATION:
- (a) Where can a pilot program be established?
- (b) Who can teach the suggested program?
- (c) How does the committee evaluate success?
- (d) Will extra funds be available for equipment-supplies?

The experimental program should be in a location where teachers can be easily assembled for in-service meetings which would include demonstration teaching. The state teacher education centers might contribute staff and/or facilities for this kind of program. Volunteer staff with appropriate training will probably welcome an opportunity to be involved in a pilot program. All evaluation does not have to be subjective, in that standardized tests will soon be available to measure pupil progress. Funds to run pilot programs might be planned as a part of regular budgeting, or foundational or Federal support could be considered.

The supervisor must provide leadership in setting up demonstration programs and in helping demonstration staff achieve the established goals.

(4) DISSEMINATION:
- (a) To whom do we make our progress reports?
- (b) How do we make reports?
- (c) Whose job – public relations?

The industrial arts teachers should have an open flow of communication. They can ask questions and contribute ideas which will be helpful to the steering and working committees. Progress bulletins, reports and meetings can provide the communication channel, but it can't be a one-way flow. Sharing is basic to success. Assuming that a group of professionals can agree on a number of curricular additions, the next step is to convince the administration that these items belong in the schools of our city, county or state. Of course, they'll have to be convinced enough to provide funds, teacher time, facilities and their stamp of approval. This group, composed of principals, superintendents and Boards of Education, is referred to as the "Legitimatizers." They are endowed under the law with authority to give the final, formal approval. There are informal "Legitimatizers" which might need consideration in many cases; among these could be found the PTA, Chamber of Commerce, Trades and Labor Council and Manufacturers' Association, to name a few.

(5) APPLICATION:
- (a) Which program goes where?
- (b) Which school can be ready first?

The application or implementation of industrial arts programs can be a traumatic experience for teachers, administrators and supervisors. The one effective method is thorough preparation. If teachers are confident of their ability, if administrators are cooperative and sympathetic, if the supervisor is supportive, and if the public relations effort has been adequate, the total program can be a success. The supervisor's role is that of organizer. He must have a plan and follow through on the myriad details of putting the program into operation.

(6) EVALUATION:
- (a) Are standardized tests used to evaluate?
- (b) How often is an evaluation necessary?

Evaluation is not a one-application step, but rather a continuing effort. If progress is being made and things are going well, the "Go" condition is set. If the plans bog down, courses of study are not suitable, and kids are not responding, the action should go into a "Hold" condition. At this point the steering committee, planning committee and the affected teachers go into conference and develop the alternate plans which were suggested.

When all conditions are A-OK the "Hold" is off and it's back into action. If everything goes wrong, the plan goes into an "Abort" condition, and a new plan is devised.

To expand or revise a curriculum and then implement or put it into action, a plan must be established, committees put to work and an open mind maintained. As industry is constantly monitoring its products and revising as the need becomes apparent, so must we analyze and alter our curriculum. No institution, group or plan is perfect, so change is in order. No program we design today will be appropriate and truly reflect industry in five years. The best plan is flexible to change. Implementation is dependent upon thorough preparation and cooperating individuals. The role of the supervisor, then, is one of developing and practicing those skills of analysis, communication, creativity, delegation, discussion, organization and leadership.

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Implementing industrial technology in grades 7-9 in Florida

Marion A. Brown

It is generally agreed that education deals with the knowledge that has accumulated through the years. Education is more important today than it was yesterday, because of advanced knowledge. Education will be more important tomorrow than it is today because of the knowledge gained today.

This has been exemplified by learned people who state that knowledge can be "blocked". Any particular block of knowledge would fit into a period of time. If this block of knowledge with its period of time were compared to the previous block of knowledge, the time of the previous block would be the square of that present block period. In other words, knowledge is gaining at a pace equal to the square root of that of the previous block of knowledge.

Knowledge can be sub-divided into three areas - science, technology and humanities. Science deals with what is found in nature; technology deals with the changes man makes in his material world; the humanities are concerned with the values of man. Science deals with what is; technology deals with what will be; and the humanities deal with what ought to be. Others will say: Science is, technology uses, humanities results.

The technologist is one who finds new ways of using the knowledge of science. We call these men inventors. Some have stumbled upon their inventions; others have spent long periods of time in methodical work, either individually or in groups, conceiving of something useful.

Manufacturing, a prime user of technology, is an institution commonly called "industry". Since industry plays such an important role in our lives, it has found a place in our educational program. For the past six decades this phase of education has been called "industrial arts". In recent years the term "industrial technology" has been applied to a new form of industrial arts.

Some of the skills, methods and techniques used in the old industrial arts will continue to be used in the new, but new developments have made a new approach to a study of industry and its technology mandatory. Former US Commissioner of Education John W. Gardner referred to the essence of this new approach in the November-December, 1962, issue of THINK Magazine, when he stated:

> If we indoctrinate young people in an elaborate set of fixed beliefs, we are ensuring their early obsolescence. The alternative is to develop skills and habits of mind which will be the instruments of continuous change and growth on the part of the individual.

In Florida, industrial technology is seen as encompassing a body of knowledge that should be included in the general education of all boys and girls. At the junior high school level this may be provided in classrooms and laboratories designed for this purpose. It should introduce young people to this aspect of their cultural heritage and aid them in learning of their interests and capabilities in the technical and industrial fields.

Man has been on earth for a period of time estimated at somewhere between 600,000 and more than one million years. For more than 99% of this time man lived in the Stone Age, so called because stone was the principal material used for making tools. Man's unique ability as a toolmaker and builder and his rational and creative nature enabled him to attain his position of dominance in the animal kingdom.

Early man was a food gatherer and necessarily nomadic. When he discovered agriculture and animal husbandry, he settled in one place. With a permanent habitat, families grew in size and clustered together to form communities and cities. Some men, not needed to produce food, were permitted to develop their talents in other directions. Thus, the metallurgist, potter, artist, medicine man and the like appeared, and each developed a technology by which he could produce goods or services. It is evident that man civilized himself through technology.

Education is an institution created by civilized man to facilitate the transmission of his cultural heritage to his offspring. As the need for change within this institution becomes evident, changes are made, but slowly. A humanistic element was added to education a century or more ago to enable the child to adjust to his social environment. Around the turn of this century, developments in science led to the introduction of a scientific element in our schools to enable children to understand and adjust to their physical environment. Paralleling the scientific development has been the most remarkable industrial-technological development the world has seen. Schools, however, still fail to reflect our industrial-technological heritage.

Industrial arts is the school subject that purports to provide a study of industry and its technology. The fact that this subject has, in general, failed to accomplish its mission is no secret. Several large-scale research studies are today helping to focus industrial arts on its important role in education. While these studies are not complete, sufficient information and evidence exists that the nature and purpose of industrial arts in contemporary education may be identified.

Industrial arts may be defined as the study of industry and its technology for purposes of general education. It deals with the origins and development of industry; the tools, materials, processes, products, opportunities, organization and problems involved in converting the earth's natural resources into man's material welfare. It involves the student in creating, designing, experimenting, inventing, constructing and operating with industrial tools, materials, processes and products.

Industrial arts serves the same general purposes of the school as do other subjects, but its unique purposes are:

(1) To develop insights and understandings of industry and its technology in our culture;

(2) To discover and develop the interests and capabilities of students in technical and industrial fields; and

(3) To develop the ability to use tools, materials and processes to solve technical problems involving the applications of science, mathematics and inventiveness.

Course content for industrial arts is obtained by analyzing the manufacturing, construction, communication, transportation, power, service, research and management categories of American industry. This analysis, made in terms of the technical, occupational, consumer, cultural and social functions of industrial arts, reveals the body of knowledge, principles, concepts and behavior that constitute this discipline. Some of the behavior elements revealed by this analysis may be identified as competencies or "salable skills" required for a happy, useful and successful life in our technological culture. They may be represented as follows:

To develop the ability to:

Analyze
Study
Plan
Judge
Describe
Demonstrate
Organize
Read
Compute
Construct
Interpret
Operate
Disassemble
Repair
Test
Experiment
Install
Cooperate
Depict
Assemble
Shape
Adjust
Invent
Engineer
Design
Create
Develop
Schedule
Display
Define
Procure
Control

These behavior skills should be the outcomes of each and every phase of education.

They are tangible, measurable competencies with perpetually marketable values. Research supports the fact that industrial arts is one of the better means for developing such competencies. Other subjects can, and should, develop these characteristics also.

The school program must provide a variety of course and subject offerings to meet the various needs, interests and capacities of youth. Because ours is an industrial-technological culture, the school program must reflect this characteristic. Furthermore, and even more importantly, the industrial arts program in a school must definitely reflect this aspect of our time and heritage.

This proposed program presents an interpretation of the above philosophy for grades 7, 8 and 9 in the Orange County (Florida) Schools. It provides three courses of study designed to attain the unique objectives of this subject in each grade.

A one-semester course in Communications is provided for the 7th grade. It introduces the student to the ways and means by which man has employed and developed technology to aid him in better communicating ideas and information. It places the traditional technical subjects of drafting, printing, photography and electronics in a new context. Instead of attempting to develop skills in the technical areas, this course attempts to develop understandings of the changes man has introduced into his capacity for communication. Opportunities for experimenting, creating, inventing, etc., and for developing greater understanding are provided through a variety of student activities. These student activities include drawing, printing, rubber stamp, silk screen, photography and possibly electronics.

A second one-semester course in Manufacturing is provided for the 8th grade. It introduces the students to the ways and means by which man obtains and changes the natural resources of the earth to produce his material welfare. It combines the traditional materials-oriented courses (wood, metal, etc.) into an approach that helps the student understand how products are designed, engineered, produced and marketed.

It makes no difference what the raw material is (wood, metal or plastics). There are certain operations that must be performed in making something useful from the raw material. These operations are (1) subtraction, (2) shaping or forming and (3) addition. After the useful item has been made, it must be sold, packaged for shipment and transported to the buyer. There must be some form of accounting to determine what the sale price will be. We live in a business society which is based on profits. There are rewards and responsibilities for each and every phase of our manufacturing industry.

This approach is used in several school systems. Industry approves of this approach; it even finances an extra-curricular activity called "Junior Achievement" which is similar to this program.

The third course of study is for a full year (ninth grade) study of power technology. Some may call this transportation, but transportation is only one use of power. The program we are proposing introduces the student to the ways and means by which man has harnessed energy to produce power to make his work easier and to move himself and the things he produces.

This "power" course of study covers the sources of power, how it is stored, how it is measured, how it is controlled, how it is distributed through hydraulics, pneumatics (fluid power), electricity, electronics and combustion (internally and externally).

Sixteen Orange County (Florida) classroom teachers, with financial help from the Florida State Department of Education, and with guidance from consultants, have developed "An Instructional Program for Teaching Industrial Technology in Grades 7-9" which follows the philosophy that has been outlined.

For a new program to be a success, it must be understood and/or accepted by the ones who will be using it. This proposed program is different from what I envisioned, but it is much better; it is the combined efforts of classroom teachers, supervisors and consultants.

The document soon to be mailed is not as complete as I would like for it to have been, but I am proud of it. I am proud because it has been developed by teachers who are now eager to teach from it. This program is one that follows measurable objectives stated in behavioral terms. The program can be implemented. It will be workable. It is a program that follows the philosophy of the Florida State Department of Education, a program that sets an example by filling a void that has long needed to be filled, a program that will give boys and girls a variety of experiences similar to those used in our industrial-technical world, a program that will help boys and girls find themselves in the world of work, a program that will show them there is a place in society for everyone and everyone is important in his place.

A copy of this proposed plan will be mailed to the State Supervisor of Industrial Arts or to the Chief State School Official.

Mr. Brown is Supervisor of Industrial Arts Education, Orange County Board of Public Instruction, Orlando, Florida.

Implementing industrial technology in grades 7-9 in Pittsburgh, Pennsylvania

Jerome F. Cosgrove

The Pittsburgh Public Schools are committed to an evolving elementary, middle and comprehensive high school structure.

Beginning with the middle school and continuing through the 12th grade, students are offered a curriculum which includes areas of academic and occupational-vocational-technical education. There are also available additional 13th and 14th years' training in the technical areas.

As can be seen in the accompanying Appendix A of Exploratory Industrial Arts, the areas of visual communication, construction, power-transportation and manufacturing are illustrated. Activities are provided within each of these broad learning areas which may serve as guides to developing concepts of the world of work.

It is hoped that in using the conceptual approach to learning, the pupil may quickly see relationships as to how materials and processes affect his life. Most important to a concept is the immediate involvement of the pupil as to where he fits into the overall picture. An appropriate analogy might be that of giving the pupil a completely assembled jigsaw picture puzzle. Immediately he is able to grasp the entire theme or picture. He can see the "whole" which is made of segments or groupings of relationships. Later, he may examine those segments labeled mathematics, history, manufacturing, electricity, etc., and assemble them into a meaningful structure.

While recognizing the importance of exploration for every pupil in all areas, the program is flexible enough to aid the individual in pursuing and expressing specific interests. This one aspect alone enhances the goal of personal achievement. The all-important guidance function toward meaningful living predominates throughout the generalized theme of assisting young people to recognize themselves and their importance to their world.

At the 6th-grade level, this program, using the team-teaching techniques, serves as a broad-based orientation in the areas of business, home economics and industrial arts. Four general concepts form the foundation for a first-level program that introduces the middle school student to facets of the "world of work." The concepts are: Human relationships-personal development; production; communication; and economics-consumership.

At the 7th-grade level of Exploratory Industrial Arts, a student is scheduled one period a day for twelve weeks in each of the areas (visual communication, manufacturing, construction and power-transportation). During that time, the student is exposed mainly to concepts as related to each particular area.

Appendix B shows possible routes by which a student may use exploratory experiences relative to vocational specialization in the 11th and 12th grades.

As the student progresses into the 8th grade, the concepts of Exploratory Industrial Arts become more specific and more comprehensive. The ensuing "hands on" and research approach at this level makes for more meaningful experiences. As the student becomes more involved with problem-solving situations, he may find it necessary to devote equal time between a manipulative process and a research process to attain answers to his questions. For example, the 7th-grade pupil learned conceptually about welding as used in industry and its vocational aspects. Now, in the 8th grade, as he attempts to weld, many problems relative to welding must be answered before he is satisfied with his accomplishment. Satisfaction may be attained by overcoming the frustrations usually associated with striking and maintaining a uniform arc; therefore, to aid in attaining that satisfaction, the student will research why and how the length of an arc, size of electrode, thickness of metal to be joined, heat distribution, etc., determine good or poor fusion.

By the very nature of time limitations and in keeping with the idea of deeper exploration in all four areas, the 8th grader moves on to experiences which were introduced in the 7th grade, but which are now available for deeper study in an individualized program. Then, at the 9th grade level, he may select two of the four areas for beginning specialization pointing toward a skill-centered program in the 11th grade.

Although the 9th-grade student may devote his efforts in two areas – for example, manufacturing and construction – the door is always open for further exploration in communication or power-transportation. Every effort is made through flexible scheduling to provide the most appropriate and rewarding experience.

The development and arrangement of the Exploratory Industrial Arts course was guided by a number of factors. The variety of functions peculiar to industries and our present and possible future culture required the inclusion of many and diverse study units to provide cultural and pre-vocational guidance. Moreover, the subject matter format was developed in order to provide for conceptual initial presentations to be followed by experiences in more depth and comprehension.

These attempts represent a concerted effort to break from the traditional industrial arts course content and methods. It is a desire that the introductory foundation formed by each unit would provide a base upon which the teacher could develop greater teaching depth in desired student experiences as facilities and learning situations warrant.

The course in visual communication provides a means in which the student may explore the role of graphic communications in the vocational, consumer and avocational phases. Typical knowledge and fundamental skills represented in this exploratory course are derived from the commercial arts, drafting and design and the graphic arts.

The learning experiences provided in the visual communication area use letterpress, offset press, silk screen processes, photography, sketching, mechanical drawing, rubber stamp making in the field of flexography, engraving and bindery procedures.

The construction laboratory provides a means by which students may explore the role of the construction industry in vocational guidance, consumer knowledge and avocational interests.

Knowledge and fundamental skills represented in this broad exploratory course are derived from the general woodworking and cabinet industry, the field of carpentry and the trowel trades. Pre-planned learning experiences are meant to provide an appreciation of good design and construction techniques relative to man's environment.

Experiences in hand woodworking are a part of the general learning activities, but certainly not to the extent that the entire philosophy of exploration in woodworking revolves around the mechanics of making a doorstop. Hand tool usage to develop a skill awareness is not discouraged, but the insatiable and unjustified desire of some teachers to have students plane, plane, plane, square, square, square a piece of wood is discouraged. The concepts of the woodworking industry of today are enriched more readily through the minor involvement of hand woodworking tools and through greater emphasis on and use of modern power equipment.

Within the carpentry segment of the construction area, the use of scale model houses has proven most effective in providing exploratory experiences in the various aspects of the carpentry trade. The student learns the nomenclature, function and limitations of various members used in constructing a floor, wall, ceiling or roof. He may be a team member co-ordinating his efforts with others. He will also be responsible for tasks to be performed as an individual or in groups using line production and assembly methods.

Where space does not present a limitation, full-size carpentry may be practiced in constructing sections of walls, partitions and roofs. This activity does present a meaningful content insofar as insulation may be added, windows and doors installed, glazing practiced, roofing placed, etc.

The experience of working with concrete and bricklaying is definitely not meant to produce the degree of skill necessary to the concrete worker, cement finisher or bricklayer. The student does have the opportunity to experiment with sand, cement, aggregate and water in preparing concrete or mortar mixes.

To reinforce his experiments, the student may use a small flower box mold into which he places concrete. Upon removal of the mold, the student can examine the concrete for properties inherent in an accepted concrete mix. Then the principles of cement curing and finishing are studied and applied toward the desired effect in a concrete structure.

Additional experimentation in masonry involves the craftsmanship of bricklaying. Many new concepts in terminology relative to bricklaying are researched. The student learns the difference between face brick and common brick. He becomes aware of such terms as mortar, bond, course, stretcher, bed joint, header, line, etc. The pupil is provided learning and doing experiences of spreading mortar, laying courses of brick, plumbing and leveling them.

Due to the close proximity of bricklaying and concrete work, the advantages, disadvantages and satisfaction derived are researched as a combined unit. Some most rewarding experiences are provided through field trips to on-site locations of house construction, talks by contractors, architects and tradesmen.

Pittsburgh, Pennsylvania, is well-known as a manufacturing and steel-producing center. The majority of its populace is in some way or other affected by facets of manufacturing and steel production. With this in mind, it is of great significance that the students of Pittsburgh schools be aware of the many manufacturing processes and their interrelationships. Numerous manufacturing firms have cooperated extensively in providing materials, personnel and facility tours for the students as an endeavor to aid the pupil in his orientation to the world of occupations.

Under the heading of manufacturing are included general metals, foundry, welding and plastics. Through closely associated techniques in the laboratory, many commonalities in manufacturing processes are developed. The transfer of knowledge and understanding from one area to another is explored and applied. There are instances where some skills, though not totally developed, may readily be employed in the various areas of manufacturing. This is of particular value when the assembly line production aspects of industry are researched by the pupil group.

The power and transportation area provides many experiences unthought of a few years ago. The more glamorous aspects of today's technology are envisioned and realized through concepts relative to power in present and future technology. The student's previous experiences in the industrial arts environments have been reinforced with materials he could see, smell, feel and form or shape into an end result of experimentation. Thinking and planning in the abstract was done to some extent, but now abstractions become more important, relative to the concepts of electricity, electronics, hydraulics and pneumatics. Not to be misconstrued, it must be kept in mind that abstracts used in the exploratory level are of the comprehension and nature to be realized and appreciated by most students of this particular age group and ability.

Small gas engines and rockets are "things" the student is much aware of today. He mows the lawn, rides go-carts and just plain "tinkers" with engines - he tinkers with power. There is much more to tinkering with gas engines than meets the eye. That boy may someday realize the full potential of rockets and by no figment of the imagination produce a real solution to many of our transportation woes - perhaps utilizing the value of steam propulsion.

It is generally recognized that methods and techniques involved in teaching industrial arts have lagged far behind the concepts of modern industrial practices. We may have facilities and equipment of the latest design, but if teachers lack knowledge, imagination and enthusiasm for new approaches to learning, the program will fail.

Because of recognized need to orient teachers for acceptance of a new approach to teaching industrial arts, a massive in-service training session was held for 66 teachers during the summer of 1966. Twelve training areas located within the city schools, local and out-of-state industries provided the intensive study and practical application of new concepts and skills. Throughout the past three years (1) additional workshops have been ongoing; (2) techniques, equipment and courses of study have been evaluated; (3) recommendations for program improvement have been made and included in the overall picture. There is nothing new or innovative regarding such procedures; yet, in a large or small school system it is imperative that teachers have a common understanding of the aims and objectives of the industrial arts program to be an effective and an integral part of the guidance function.

To show the extent of the exploratory program as shown in Appendix C, an accompanying list of involvement depicts 16 schools having 52 industrial arts teachers now implementing the areas of visual communication, construction, manufacturing and power-transportation.

In most instances, one teacher is assigned one lab, but in other examples, depending upon facilities, one teacher is able to co-ordinate some offerings in two, three or four areas. These arrangements are presently undergoing scrutiny as to the versatility of teachers and laboratories regarding future curriculum and facility development toward meaningful learning experiences for all children.

Mr. Cosgrove teaches in the Pittsburgh (Pa.) Public Schools.

APPENDIX A

PITTSBURGH PUBLIC SCHOOLS
DIVISION OF OCCUPATIONAL, VOCATIONAL AND TECHNICAL EDUCATION

EXPLORATORY INDUSTRIAL ARTS

VISUAL COMMUNICATION

- Printing
  - Letter Press
  - Offset
- Silk Screen
- Photography
- Mechanical Drawing
- Rubber Stamp
- Engravograph
- Bookbinding

CONSTRUCTION

- General and Bench Wood
- Carpentry
  - Full Size
  - Scale Model
- Masonry
  - Concrete
  - Brick

MANUFACTURING

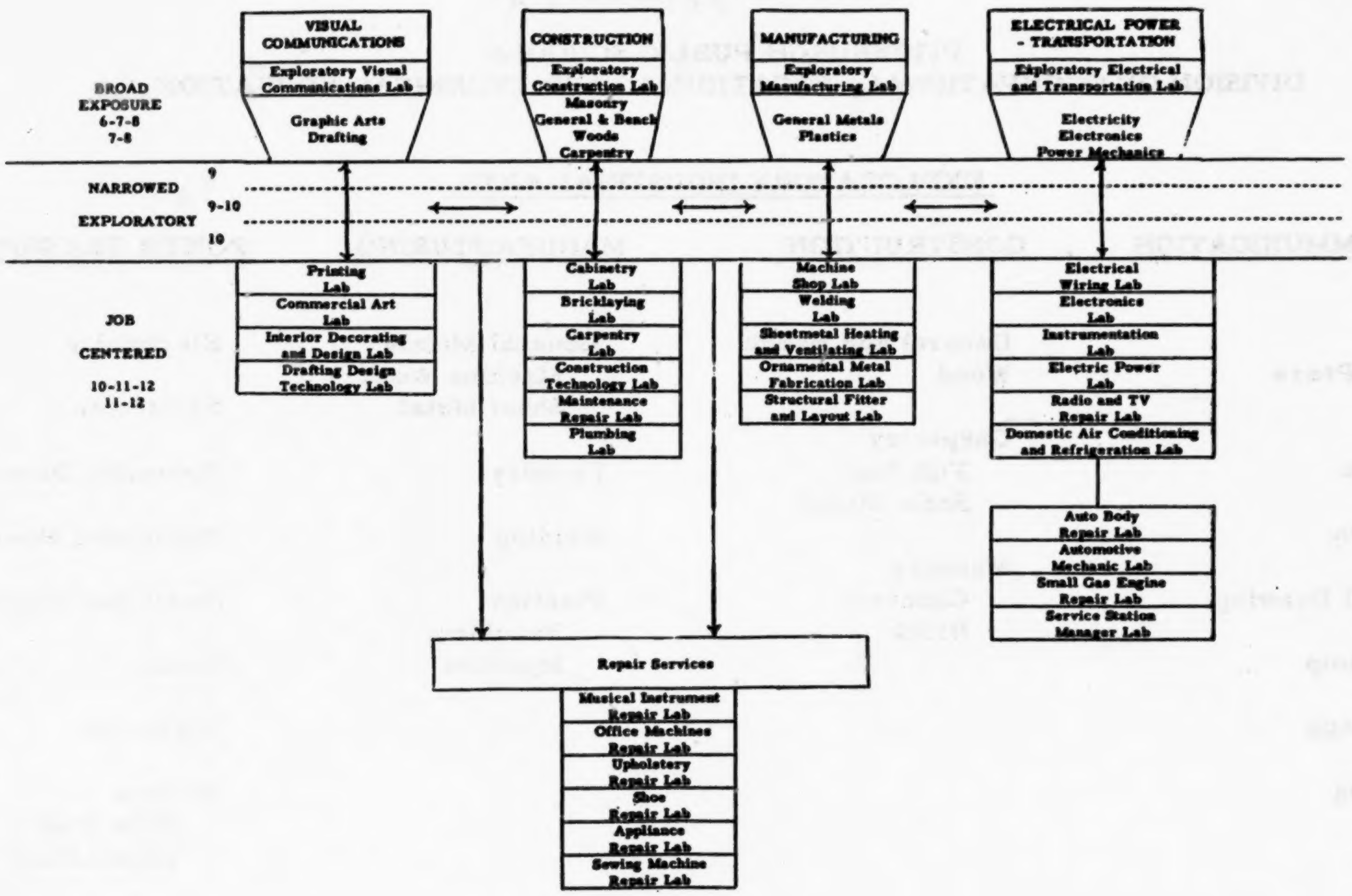
- General Metals
  - Machine Work
  - Sheet Metal
- Foundry
- Welding
- Plastics
  - Vacuform
  - Injection

POWER TRANSPORTATION

- Electricity
- Electronic
- Hydraulic Power
- Pneumatic Power
- Small Gas Engine
- Steam
- Turbo Jet
- Rockets
  - Solid Fuel
  - Liquid Fuel

APPENDIX B

EXPLORATORY - INDUSTRIAL


BROAD
EXPOSURE
6-7-8
7-8
NARROWED
9
9-10
EXPLORATORY
10
JOB
CENTERED
10-11-12
11-12
VISUAL COMMUNICATIONS
Exploratory Visual Communications Lab
Graphic Arts
Drafting
CONSTRUCTION
Exploratory Construction Lab
Masonry
General & Bench Woods
Carpentry
MANUFACTURING
Exploratory Manufacturing Lab
General Metals
Plastics
ELECTRICAL POWER - TRANSPORTATION
Exploratory Electrical and Transportation Lab
Electricity
Electronics
Power Mechanics
Printing Lab
Commercial Art Lab
Interior Decorating and Design Lab
Drafting Design Technology Lab
Cabinetry Lab
Bricklaying Lab
Carpentry Lab
Construction Technology Lab
Maintenance Repair Lab
Plumbing Lab
Machine Shop Lab
Welding Lab
Sheetmetal Heating and Ventilating Lab
Ornamental Metal Fabrication Lab
Structural Fitter and Layout Lab
Electrical Wiring Lab
Electronics Lab
Instrumentation Lab
Electric Power Lab
Radio and TV Repair Lab
Domestic Air Conditioning and Refrigeration Lab
Auto Body Repair Lab
Automotive Mechanic Lab
Small Gas Engine Repair Lab
Service Station Manager Lab
Repair Services
Musical Instrument Repair Lab
Office Machines Repair Lab
Upholstery Repair Lab
Shoe Repair Lab
Appliance Repair Lab
Sewing Machine Repair Lab

APPENDIX C

HERRON HILL JR. **KNOXVILLE JR.** **LATIMER JR.** **PROSPECT JR.** **WESTINGHOUSE**	**Manufacturing** **Communications** **Power & Transportation** **Construction**
FIFTH AVENUE	**Communications** **Manufacturing**
STEVENS	**Construction** **Manufacturing**
MCNAUGHER	**Construction** **Power & Transportation** **Communications**
SOUTH	**Construction** **Manufacturing**
PEABODY	**Construction** **Communications** **Manufacturing**
GREENFIELD JR.	**Construction** **Manufacturing** **Communications**
FRICK	**Construction** **Communications**
OLIVER	**Communications** **Power & Transportation** **Manufacturing**
HOLMES	**Construction** **Communications**
CONROY JR.	**Manufacturing** **Construction** **Communications**
OVERBROOK	**Representative version of all four labs and is now in full operation.**

Environmental education and the role of industrial arts

Dean B. Bennett

Industrial arts has more, much more, to contribute to the education of our youth than a great many in our profession, including many in our own field, seem to recognize. At no other time since industrial arts became an accepted part of the curriculum does this subject area have more to offer our nation than it does now. It has today an unprecedented opportunity to stand squarely on its feet with merit, and in the front line with those other generals of educational stature, including mathematics, English, science and social studies.

Industrial arts can help fulfill a need which desperately reaches out from the pages of our newspapers and magazines, pleads from our television sets, and accompanies our walks and rides through our own neighborhoods. It's a need to resolve the critical social and environmental problems facing our communities, our states and our nation today. These problems are related because we ourselves are partly products of our environments. Problems of the biphysical environment including those affecting its quality offer a challenge to the field of education.

Pick up any newspaper and I daresay that somewhere within its pages will be a reference to zoning, housing, traffic congestion, pesticides, solid waste disposal, water pollution, air pollution, loss of habitat and wildlife, or some other environmental problem. These kinds of problems require the attention, study, concern and action of citizens if they are to be successfully resolved. And the development of good citizens has long been an accepted goal and responsibility of the school and of general education.

We as a profession have long recognized the contribution of industrial arts to the development of individuals who need to understand the workings of American industry, who need to explore their talents, who need to understand the solving of problems using tools, materials and processes, and who need to gain experience in using tools and equipment safely and skillfully. And within the scope of these valuable objectives, industrial arts can make a significant contribution to developing citizens who care about, who can and who will help resolve those problems affecting the quality of the environment and its ability to meet our needs. This is the primary purpose of a developing curriculum emphasis called environmental education.

Over the years there has been spotty concern for the environment reflected by such programs as nature study, outdoor education, conservation education and resource use education. These have been educational attempts to produce citizens who could successfully cope with problems of dwindling natural resources and endangered wildlife – citizens who could keep pace with a changing environment. Within a relatively recent span of time our nation has been undergoing an acceleration of change – often pronounced and often subtle. From agrarian to industrial, from rural to urban, from independence to interdependence – America today is a nation of people experiencing an affluent life of increasing leisure time, mobility, relief from domestic toil, and good health and long life. Seventy percent of us are now living on one and one-half percent of the land. We are dependent upon our technology and our industry to create the goods, services and the environment which will provide for our needs at a rate which will satisfy them. It is no wonder that we are making unprecedented demands on our environment with many unpredictable and detrimental consequences. Socially our man-to-man relationships are being strained, sometimes dangerously near their limits, with problems of war, crime, poverty, racial tension and dissatisfaction with the institutional structure and its policies.

Our social problems and environmental problems are closely interwoven within the fabric of the institutional and technological structures we've established, within the behavior patterns we've developed, and within the natural laws working in our environment. Man is dependent upon his environment, and science has long recognized the concept that man is partly a product of his environment; he can affect it, but it, in turn, affects him. The physical environment motivates man politically, economically, socially and, we hope, humanely. Man's environment, thus, is a dominant force in his life.

As our knowledge of the environment increases and environmental problems become broader in scope and more critical, there is a growing awareness that man must understand and control his total environment – the man-made as well as the natural. His decision-making must draw upon a broader base of knowledge including an understanding of social, economic, technological and ecological principles leading to a better understanding of the consequences of his actions. As a result of this need, environmental education has evolved as an emphasis in the curriculum designed to help the school produce knowledgeable and concerned citizens. It has evolved from those earlier educational areas mentioned before and has taken from them and blended those ingredients necessary for the kind of citizen action we desperately need today.

The major objective of environmental education at the elementary and secondary levels is to help the school produce citizens who have a knowledge of the biophysical environment and its problems, who know how to help solve these problems, and who are motivated to help solve them. More specifically it attempts to develop attitudes towards the biophysical environment and its problems – attitudes which contain feelings, understandings and a tendency to act to solve and prevent problems.(1)

A pilot program in the Yarmouth, Maine, public school system was established last fall to implement and test this concept of environmental education. The program represents a major step, we think, for a community with only 1200 students, kindergarten through grade twelve. The town itself is underwriting the salary of a fulltime coordinator, and this reflects a real concern by its citizens for environmental quality as well as a belief in the role and value of education.

The program has three major thrusts: (1) Curriculum emphasis and continuity, (2) school site development, and (3) teacher in-service education and resource center. The curriculum phase of the program focuses what students are studying in science, math, social studies and other subject areas on the biophysical environment and its problems. In grades K through six, theme environments have been chosen: K-1, the school; 2-3, the neighborhood; 4-5, the community; and grade 6, the region. Within these theme environments, environmental problems are selected for student recognition, study and problem-solving conservation activity. Since these environments move from what is close to the learner to what is more distant and expand in scope, the problems encountered by the students, as they progress through the grade levels, become more complex. The sequence of implementation at each grade level follows this procedure: (1) A pretest of a random sampling of students to see what their interests and concerns are regarding the theme environment, (2) preparation and distribution of a teaching guide and kit, (3) workshop for teachers and community volunteer field trip guides, (4) classroom presentation about the theme environment and selected problems, (5) field trip by bus and on foot through the environment (community volunteer guides enable classes to be broken down into small groups), and (6) follow-up investigative, planning and conservation activities involving students in activities where they actually help to resolve an environmenal problem. At the secondary level, the coordinator gives classroom presentations, helps to organize special field trips and environmental improvement projects, and advises students.

The second major phase of the program, school site development, is concerned with the acquisition and improvement of school sites for two primary purposes: (1) To be used as outdoor teaching laboratories and (2) to be used by citizens and visitors in the community as outdoor natural recreational areas – green islands within the community. Steering committees are organized which are made up of citizens, teachers, administrators and students who plan the site, inventory its natural and man-made features, and develop such things as trails, habitats, landscaped areas and site furniture.

The third major phase involves the collecting, reviewing and cataloging of teaching materials and aids which are made available to teachers through a resource center. Special projects are carried out to up-date and strengthen teachers in this field.

Industrial arts can play a major role in environmental education. Traditionally there has been only a slight recognition that industrial arts can significantly impart conservation understandings. Too often conservation is only found in the last chapter in some of our texts. Most of the emphasis on conservation has been in science and social studies. Unfortunately the potential which industrial arts possesses for developing concerned and knowledgeable citizens has received little attention.

Industrial arts is ideally suited in several respects for including environmental education understandings:

(1) Industrial arts is the only subject area in general education specifically related to the study of industry and technology – the source and also the solution of many of our environmental problems.

(2) Industrial arts is dependent upon activity for its teaching, and interesting and meaningful activity is recognized as one of the keys to effective learning. Industrial arts activities involve students directly in resource planning and use.

(3) Industrial arts by its nature is concerned heavily with the physical aspects of the environment – our natural resources and those products created and maintained to improve our environment and to allow for its more efficient and better utilization.

There are many ways industrial arts can help achieve the school's goal of an environmentally concerned and knowledgeable citizenry that knows the meaning of conservation and practices it. Generally, industrial arts can involve students in the entire sequence of the process from raw material to the finished product, including its effects of use, maintenance and disposal. Industrial arts can help give an appreciation of design, of materials and of their characteristics. It can help students to understand the environmental effects of industry and the opportunities for environmental improvement which industry and technology afford us.

At the elementary level industrial arts is a "natural" to work with environmental education. A Title III application recently filed in Maine to expand the Yarmouth program regionally and statewide includes a proposal for an elementary industrial arts program to strengthen the investigative, planning and conservation or environmental improvement activities which follow the field trips. A qualified instructor with a specially-equipped van containing portable classroom and field equipment will assist students in carrying out activities.

Investigative activities could include locating, mapping and inventorying natural resources around the school and community, learning the characteristics of natural resources, and discovering the effects of processes and products on the environment.

Planning activities could include designing, testing, surveying and organizing in preparation for environmental improvement activities.

Conservation activities could include school beautification projects – planters, attractive litter containers, walkways, signs; constructing well-designed play equipment; development of outdoor interpretive trails and facilities; and educational displays and exhibits to arouse public interest and concern.

At the secondary level environmental education can be integrated into typical industrial arts units. For example, in a unit taught at the eighth grade in which students study the manufacture of camping equipment, the coordinator gave presentations on a survey of outdoor recreation in the state and on the conflicts sometimes existing between industrial and recreational development. Students had an opportunity to test their equipment on a special outing during which the coordinator led them in studying a local park area. *In a unit on residential* construction at the sophomore level, a presentation was given on the value of preserving open space in a community, the principle of cluster development, and the construction of site furniture for better utilization of the outdoors. This was followed by the designing, construction and installation of a sign for the school's outdoor environmental center, trail orientation station, and trail signs.

These are only a few examples of the many ways industrial arts can work with environmental education. Today, more than ever before, education needs to be relevant to the outside world beyond the four classroom walls. Industrial arts can be a moving force in our school systems helping to bridge the gap which too often exists between school and community. The opportunity is ours; we can, today, make a significant contribution to helping the school develop the citizens we need for tomorrow.

REFERENCE

(1) Environmental Education. A brochure published by The University of Michigan, School of Natural Resources, 1969.

Mr. Bennett teaches at Yarmouth (Maine) Intermediate School.

The comprehensive high school of the '70's

Robert W. Fricker

Parma's approach to industrial-vocational education in a school system is one of the many challenges large suburban communities will have to face in the near future. Much has been written about the comprehensive high school, but very few of us in the field have been able to design and construct a physical facility such as Normandy, which is our newest senior high school in the Parma City School District.

Background. Parma is the largest of 31 suburbs surrounding the city of Cleveland. The three cities in our school district, Parma, Parma Heights and Seven Hills, encompass 19 square miles with a total population of approximately 150,000. At present over 25,000 public school students are enrolled. In addition, approximately 12,000 students are enrolled in parochial schools within the district. Since World War II the Parma City School System has grown at a phenomenal rate. The trend for Clevelanders to move to suburbia after the war was part of a nationwide happening in all major cities. Our comprehensive industrial education program in 1950 was limited but highly successful, and still operates on a 6-3-3 basis.

Due to the influx of students in the early '50's, plans were formulated for our first new senior high school in twenty-five years. Parma Senior High School opened in 1954. A second high school, Valley Forge, was built in 1961, and Normandy High School opened this fall.

School District Statistics

	1954	1969
Number of students	6,000	25,000
Number of staff members	154	1,200
Number of buildings	6	31
District population	49,000	150,000

Secondary School Building Program

1954	Laboratories and Shops	1969	Laboratories and Shops
Parma Senior High	11	Valley Forge High	12
Schaaf Jr. High	4	Hillside Jr. High	4
Pleasant Valley Jr. High	4	Greenbriar Jr. High	3
Total	19	Shiloh Jr. High	4
		Normandy High School	32
		New Jr. High (planned)	4
		Total	59

Grand total - 78 shops or laboratories

Staff. The industrial arts instructors average five years' industrial experience as well as 5.9 years' teaching experience. The vocational instructional staff averages 12.8 industrial experience and 6.8 teaching experience. The combination of industrial as well as professional experience provides a rare combination that forms a strong base for the success of any major program of industrial education.

Cost and equipment. The total building costs for Normandy, our newest high school, were in excess of $6,000,000.00 of which $1,444,000.00 represents matching funds, local, state and federal. Of this figure approximately $500,000.00 was spent on equipment and tooling for the vocational areas. In industrial arts, the seven major areas were equipped at a cost of $200,000.00 to the local Board of Education.

Building features and floor plan. The building design is semi-circular in nature and is of a domed construction. The building was constructed on a hillside and is laid out like a baseball diamond, home plate being the library in front-center, first base the gymnasium which seats 3000, and third base the auditorium which seats 1400. The base path from third to first base is a three-story unit laid out in a semi-circle. The first floor contains all industrial and vocational T & I laboratories with separate related classrooms.

First Floor

- Cosmetology (related classroom, junior and senior labs)
- Vocational Offset Printing
- Basic Electricity
- Industrial arts-graphic arts
- Industrial arts general metals (R&D)
- Industrial arts wood
- Vocational machine trades
- Industrial arts power mechanics
- Vocational auto mechanics
- Vocational welding
- Vocational food services kitchen
- Sword and Shield Room (dining room) and related food services classroom and snack bar

Second Floor

- Vocational Commercial Art Studio
- Distributive Education lab and instructor's office
- Cooperative office education lab and instructor's office
- Occupational work experience lab and instructor's office
- Two vocational typing labs
- One adjoined office machine room
- Business Office Education labs and shorthand-dictation labs
- Data processing (including a separate room for keypunch and simulators)
  A related classroom for board wiring and program writing, and a machines lab. The machines lab has a separate air conditioning and humidity controlled feature.
- Two drafting rooms - one industrial arts, one vocational

Third Floor

- Four large team teaching rooms to handle 150 students each or to be divided into three individual classrooms with a capacity of 50 students each.
- All other related academic science, math, English facilities are on the third floor to make this a most complete comprehensive high school.

Industrial arts. The industrial arts laboratories have been designed to give complete flexibility to both the students and instructors. To simulate industry as much as possible, there is an absence of the corridor wall in graphic arts, electricity, general metals, machine trades and power mechanics. The building has been constructed with low accoustically-treated ceilings and walls. Each laboratory has a separate, air-conditioned, related classroom across the corridor.

Utilities are located in ceilings, and all non-bearing walls in the entire building are metal partitioned so that maximum flexibility is available at any given time.

In the total building space of 265,000 square feet, 60,000 square feet (or approximately 22.8%) were designated for industrial and vocational education with the emphasis on designing a facility that would attract either college-bound or industrial-vocational education students who wish to take advantage of the program offerings. The increase and allocation of laboratory space in this building is due to the increased interest by students in our school district. Comparatively, in 1961 Valley Forge High was opened with 9,600 square feet allocated for industrial arts. In Normandy, 16,600 square feet were assigned to the industrial arts expansion program. Conversely, there are 7,600 square feet in Valley Forge for vocational education to 40,800 square feet for vocational education laboratories in Normandy.

The interest in industrial arts and vocational education is reassuring to those in leadership positions in Parma and we are planning to explore possibilities for expansion at all levels, K thru 12, to assist students in achieving either one of three goals; (1) College or entry employment with a wholesome attitude toward the world of work; (2) enough school-related experiences to work with others; and (3) confidence that they can use the salable skills to the best advantage when given the opportunity to perform in business and industry.

Mr. Fricker teaches in the Parma (Ohio) Public Schools.

Curriculum content based on experimentation and industry

Jack W. Chaplin

Our topic is entitled "Demonstration of Curriculum Content Based on Experimentation and Industry". This describes the curriculum content based upon experiments, and it stresses the core concepts and understandings found in the American industrial society.

The curriculum which implements these core understandings we have entitled industrial studies. The desired outcomes of the Industrial Studies program are listed:

(1) To make available a program of general education for youth who are about to enter a highly technological society of the 1970's and 1980's.

(2) To develop a vocabulary and the concepts necessary to live successfully in an automated society.

(3) To develop problem-solving and decision-making procedures that are utilized in a technological society.

(4) To provide the discipline with a logical scope and sequence of an organized curriculum.

The major themes running throughout the industrial studies curriculum are these:

(1) Building the understanding of the organization necessary to bring about a large economically-efficient industrial manufacturing system and the many jobs involved.

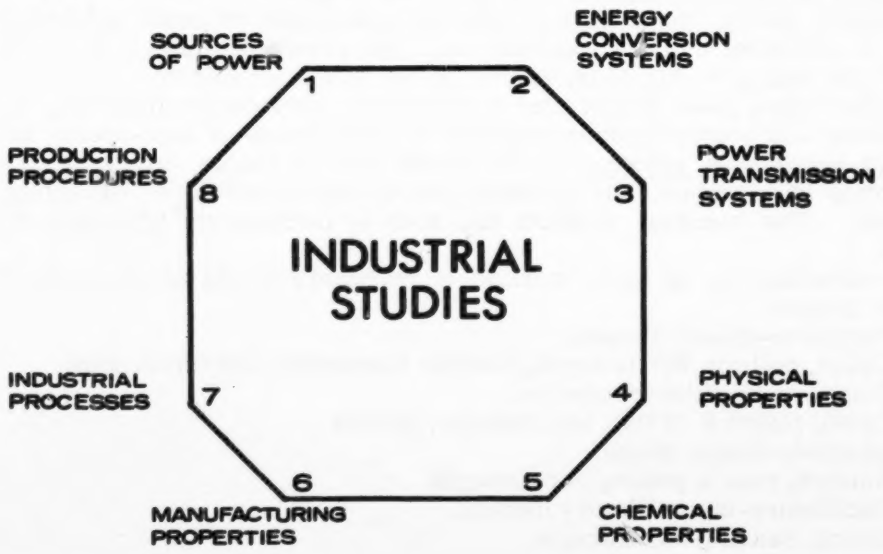
(2) Developing insight into the planning and production procedures necessary for automated production.

(3) Building vocabulary and new concepts around industrial problem-solving and decision-making.

In the initial stages this program may be introduced as part of, or parallel to, any industrial arts shop or laboratory program. This program does not challenge or replace any existing strong industrial arts program.

The Industrial Studies Program is a curriculum effort which differs from other curriculum approaches in that its major effort from the beginning was to identify a body of knowledge which is relevant to our space age technology and can be implemented in the existing shop programs and existing facilities. The core concepts and understandings may be introduced at the junior high or secondary school level and be run parallel to an existing program of wood, metal, drafting, auto, ceramics, plastics and graphic arts.

The emphasis of the curriculum is upon students' needs, since they will be living in a highly technical world of the decades of the 1970's and 1980's. With these thoughts in mind the group presents these suggestions:



As you see in the model, there are eight major areas of curriculum knowledge present. There are possibly other areas that could be chosen. However, these were arrived at after careful deliberation in reducing the total industrial content to a workable size. The selection of these areas made it possible to present meaningful material in a structure with a scope and sequence to the students.

The sequence was designed so that for initial stages of introduction the curriculum could be offered as eight one-week units integrated within the present shop or laboratory program.

As additional material becomes available, the curriculum content may be expanded into a semester class or a full-year course.

Eventually the industrial studies program will develop into a (2)- or (4)-year course of study for the students.

As you will observe, any number of combinations of time and units may be arranged to meet the needs of your local school program.

The curricular structure consists of areas of study entitled:

(1) Sources of Power
(2) Energy Conversion Systems
(3) Power Transmission Systems
(4) Physical Properties
(5) Chemical Properties
(6) Manufacturing Properties
(7) Industrial Processes
(8) Production Procedures

This program instructs the students from the basic sources of energy and materials to the production of products, goods and services produced through automation.

The presentation of the first three areas of (1) sources of power, (2) energy conversion systems and (3) power transmission systems provides background material for the total program. The source of the information is historical and scientific. Such authors as Delmar Olson, Sullivan and Thompson, Bohn and MacDonald have provided ideas for content for these three areas. The most current source for these areas is soon to be published in a junior high textbook by Ralph C. Bohn and Angus MacDonald, entitled Power—Mechanics of Energy Control.

Sources of power. This curricular area is concerned with two parts identified as (1) natural power and (2) processed power. The basic source of natural power is the sun's energy and gravity. This energy has provided the power that man may use by designing machines to utilize its force to do his work. The basic machines use the imbalanced heat equilibriums which cause rain to fall and water to flow.

The imbalance in nature's heat systems makes it possible for man to build machines to harness natural power. The wind is used for sailing ships, turning windmills and transporting vast amounts of water. The rain and snow provide energy in dams and turbines to provide our electrical power. The sun and water also provide energy through growing products such as fossils, i.e., fuel, coal and modern food.

Processed power, then, begins with the conversion of foods and fuels into usable energy. In prehistoric times man had only this power available to him. His food was converted into energy by his body, and the power was generated by his muscles, legs and arms. It took man a great deal of time to learn how, with simple machines, he could amplify his power and convert processed power to short spurts of high-energy intensity.

Energy conversion systems. The conversion of energy (processed power) into a usable motion is a problem the inventors and engineers have been struggling with since Archimedes. The constant problem has been to increase the efficiency of the energy convertor.

The understanding of basic motions is necessary to the development of an energy conversion system.

(1) Rotary-to-rotary motion.
    Gears, pulleys, bar linkages, flexible converters (universal joint)
(2) Rotary-to-oscillatory motion.
    Cams, piston & crank, bar linkages, geneva
(3) Rotary-to-linear motion.
    Ratchet, rack & pinion, bar linkages
(4) Oscillatory-to-oscillatory motion.
    Gears, ratchet, bar linkages
(5) Oscillatory-to-linear motion.
    Scotch yoke, rockers, linkage systems
(6) Linear-to-linear motion.
    Linkages, fluid

Mechanical systems (heat conversion systems). With the invention of motion converter, a mechanical system may be built from a series of motion converters. A more efficient mechanical system may be referred to as a heat engine.

The heat engines include such complex machines as the steam engine, internal combustion engine, and turbine (water, steam, gas). Our aircraft jet is a combination of two of the aforementioned.

These heat conversion systems provide us with the mechanical motion to provide other sources of power.

Electrical power systems. The conversion of mechanical into electrical motion gives rise to the study of the electrical power production systems of America. The program covers the various sources of energy utilized by our power companies including nuclear power.

Chemical power. With today's space technology, chemicals have become a rapid energy conversion system. With the development of rocket motors, a very complex technology of propellants has evolved. These chemical compounds may be classified as to their physical state: Liquid propellants and solid propellants.

These energy conversion systems of fuel and motors convert vast amounts of energy over short periods of time.

Power transmission systems. Mechanical linkages are the earliest and most common power transmission systems. These mechanical systems include rigid links and flexible links.

The rigid links include: Bars, cams, shafts, gears, etc.

The flexible links include: Belts, chains, cable, rope, rods, fluid, magnetic, etc.

Electrical power transmission systems. The program studies the design of electrical power transmission from the generator and transformers at the dam or steamplant to the substation distribution point and on to the power transmission through distribution to the consumer.

Fluid power transmission. This program is concerned with studies on how energy may be transmitted by means of compressed gas or fluid. It is the study of application of power to industrial hydraulics and pneumatics, the real work horses of industry today.

Fluidics power transmission and control systems. The fluid logic systems which are being introduced into the heavy automated production systems are presented in this study. Decision circuits, amplification circuits and controlling circuits are the concerns of this area.

Electronic power transmission. This program is one which demands considerable emphasis. It includes two things: the energy for manufacture, and the information and control for manufacture, i.e., the study of gaining information, the decision as to what to do on the basis of the information gained, and the control of the industrial machine. The study ranges from simple power circuits to the problems that computers solve or provide control.

Industrial properties of materials

Thomas J. Powers

The modern student has to have a vocabulary and an understanding of concepts upon which he can call in future endeavors to understand industry and its operations. The student of today is going to be deeply involved in American industry or in world industry in the immediate future. A part of this understanding is having a working knowledge, or knowledge and concepts at the recall level, that will allow him to be comfortable with the terminology found on the three charts I am going to present to you at this time.

To produce an item, we must be able intelligently and objectively to pick a material for the item that will do the job most effectively. We have felt that there are three categories in which you must work to make a proper choice of materials for the production of an item. These have to do with the properties of materials and are as follows: physical properties, chemical properties and manufacturing properties.

The physical properties have to do with such things as specific gravity, thermal conductivity, melting points, modulus of elasticity, tensile strength and others. We will try to convey to the students concepts that will support this terminology by having students subject a material to as many tests as practicable using student-made specimens or available forms as test items. Thus they become comfortable with the meaning of the terms and familiar with the limitations of the material under consideration.

A project approach could now be set up to help in this understanding of these properties, or an idea could be pursued that would necessitate choosing the most appropriate material from which to produce an item. How about making a gaming chip since all of you have so many of them in your pockets now; what would be the selection process for the proper material from which to make this item?

Let's go through physical properties and see what avenues of understanding open up.

First, possible materials could be arbitrarily selected.

Metal - would be OK.
Plastic - would be fine.
Wood - no.
Ceramics - glass a possibility.
Rubber - some checks are already made this way.
Metal and plastic look like good choices; ceramics another.

Getting back to our properties we would find weight or specific gravity would possibly be of some major importance to give the chip proper feel – not too heavy nor too light. If using metal, then lead and magnesium would be two extremes. The student would have to gain an understanding of the terms and look up specific gravity of possible materials, and a range could then be established.

Electrical resistivity would not be of too much importance, but if used, plastics and ceramics would win hands down. A use could be made of electrical resistivity by using it as a check on the chip in use; for example, a certain resistivity would be needed in a machine to either accept or reject a chip. If this were to be used, a metallic-type chip would probably have to be made, or metal and plastic in combination.

Thermal conductivity would not be too important, but for that certain "feel" it would of course have to be considered, since there are some that like cold hard cash and this might influence a choice.

Coefficient of thermal expansion is a property that could be very important. If the chip expands too much due to temperature variations, it might not work too well in machines. The item must remain dimensionally stable throughout a wide temperature range.

Now that we have metals with very low melting points, we do not want to manufacture a chip that might melt in your hand. We must consider the melting point of any possible material, keeping its use and manufacturing properties in mind.

Modulus of elasticity and tensile strength would not be too important for the chip, but for longevity and ability to maintain its shape, material hardness and impact strength would certainly rate high in importance of necessary properties for a material for a product such as this.

Some test apparatus would of course be needed to run some of the tests to compare the materials of possible choice. A simple balance scale could be used for specific gravity, a torch and a low-cost pyrometer might be used for the melting point, or possibly just charts with this information given for the various materials would be enough. A tensile strength tester could be fabricated. We have made a set of jaws for one. A hardness tester and other devices for comparative testing could be either teacher-made, student-made, purchased from surplus, or donated to the school by industry.

A choice cannot be made without knowing something about the terminology found on the charts. The product is not important here, but the ideas are very important, and the ideas and concepts that are understood from going through this selection process will possibly stay with the student for many years to come. These ideas can be taken into industry and can be moved from job to job.

Let's look at chemical properties. This brings up additional areas of study. How does the item fare in various atmospheres like pockets, purses and rooms like this? What happens if a drink is spilled on it, or other chemicals come into contact with it?

Here again many materials would be needed, such as jars for acids, solvents, and chemicals for testing your selections in various atmospheres. A furnace could be used for a simple burn rate test and so on.

Now let's look at manufacturing properties and think of the concepts that have to be understood. Should we machine the item, cast it, coin it, heat treat it, do special things to its surface finish, laminate it or join two halves together? How much will the end product cost? How available will the material be when production starts? A whole year or more could be spent on manufacturing properties alone if great depth was the desire.

If the student can carry a material through all these considerations, then he should have a good command of all the concepts that these entail. This would mean that some decisions will have to be made based on the choices available. These thought processes are our products. This is what the student will take home with him and carry with him from job to job throughout life. He will be able to research a problem, make decisions, and carry things through to completion.

Industrial processes

Lewis A. Oetinger

In the area of industrial processes, the problem was no different from the preceding units except that in this area, categories could not be easily found. Therefore, the problem was to design a method of presenting industrial processes in a logical order. We attempted to form categories which would allow the design to be as all-inclusive as possible. We started each category with a high level of abstraction and attempted to work down to the student level. The results of work we have done to solve the problem appear in chart form.

The five categories across the top of the chart cover as many of the industrial processes as we could conceive and still limit the study. The five classifications are as follows: Particle redistribution, particle separation, particle temperature change, particle size enlargement, particle size reduction. The charts include wood, metal, plastics, ceramics and glass. Other materials could be included in the study. To understand the meaning of the various categories, we must use a definition for the word "particle", meaning items from molecular size to items the size of a dime, as the frame of reference. Under each of the categories we placed the concepts, experience and curriculum examples pertaining to that particular activity. You will notice these headings are listed vertically along the edge of the chart.

This particular chart has given rise to many hours of thought and discussion and on several occasions to some rather heated debates. The general opinion seems to be that we now have a representative workable design. However, we have by no means expanded all the possibilities, especially in the concepts area. Our intent for this design might become clearer by taking an example and carrying it through the various stages. For instance, under particle redistribution we might take the applied concept squeezing. The experiences or classroom activity would consist of making the student aware of the rolling and extrusion processes. Developing student awareness might be brought about by lectures, reading, film clips, motion pictures, visual aids, or any other method the instructor deems necessary. The third level, curriculum examples or lab activity, could include extruding a round shape through the use of a die. By the use of a simple die and punch with some type of mechanical advantage mechanism, molding clay could be easily extruded. Admittedly some new pieces of equipment are going to be needed to implement the suggested program. However, we feel that initial cost might be kept down by shop-constructed equipment. The level of sophistication may be low, but the concept can be reinforced by simple examples. For instance: Dr. Chaplin had a press which was constructed at San Jose State, so we ran an experiment in particle size enlargement with a concept of powder metallurgy. The experiment took place in the Metal I classes at Fremont High School, Sunnyvale. We would like to give you a brief description of the experiment to give you some feel for the possibilities of this area.

We pre-tested with a fifty-question multiple choice test developed by the designers. Secondly, we demonstrated the press by compacting some metal powders in a simple die made from an axle male and female spline. We were attempting to build interest at this point, and we followed up by handing out a list of terms and definitions which would apply to the overall course. This step was deemed necessary since we were introducing the student to material taken out of context.

We then presented a lecture concerning the powdered metallurgical processes. This was our attempt to satisfy the second step of our design "experiences" under which we have "sintering and compaction." The lecture began with a definition of powder metal "The Technique of Agglomerating Metal Powders into Engineering Components." We then broke this definition down by stating that powder metallurgy consists of pressing metal powders into a forming die under considerable pressure thus forming a part which is the shape of the die.

The common types of powders were discussed along with the method for producing metal powders such as electrolysis, plasma and oxides. The sintering process was described along with coining procedures. The common tolerances that could be expected were brought out, and the engineering aspects of a powdered part were introduced. We spent a considerable amount of time at this point attempting to relate to the phases of the design which should have preceded this unit. Items such as physical, chemical and manufacturing properties were included in the discussion. Some of the industrial processes

INDUSTRIAL PROCESSES

Code

Metal *   Ceramics & Glass #
Wood +   Plastics 0

	PART. REDISTRIBUTION		PART. SEPARATION		PART. TEMP. CHANGE		PART. SIZE ENLARGEMENT		PART. SIZE REDUCTION	
	Sci	Applied	Sci	Applied	Sci	Applied	Sci	Applied	Sci	
CONCEPTS	Heat Pressure	Drawing Out *# Squeezing *+#0 Upsetting * Hot Forming *#0 Bending *+#0 Blowing *#0	Heat Pressure	Chip Generation *+0	Heat Pressure Cool	Cohesion *#0 Adhesion *#0+ Friction *+#0 Phase Change *#	Heat Pressure	Powder Metalurgy * Roasting * Fibering +#0	Heat Pressure	Digestion *+# Fracturing *+#
EXPERIENCES		Drawing Wire, Presswork *#0 Rolling, Extrusion *#0 Compressing wood Fragments + Forging, Presswork * Molding *#0 Bending *+#0 Blow Forming *#0		Tool Geometry - Cutting Tool Material *+0 Speeds & Feeds - Work Material *+0		Fusion Welding *#0 Eutectic Alloys * Polymerization *+#0 Surface Finishing *+#0 Heat Treatment *#		Sintering - Compaction * Coke Production * Firing Concentrates * Laminating - Fibers & Sheets +#0		Dissolving Materials *+# Material Fracturing *+#
CURRICULUM EXAMPLES		Drawing-Sheets, Rods, & Tubes *#0 Rolling-Sheets, Rods, & Tubes *#0 Extrusion-Forward & Reverse *#0 Pressing Wood Chips + Roll Forging * Casting-Gravity & Injection *#0 Transfer Molding 0 Injection Molding 0 Vacuum Forming 0 Bending-Angular & Radius *+#0 Blowing-Glass & Plastic *#0		Planning *+ Turning *+0 Broaching *0 Shaping *+0 Sawing *+0 Drilling *+0 Boring *0 Grinding *0 Milling *0 Jointing +0 Chopping + Chiseling + Lapping *# Sanding +0		Welding Arc * Gas *#0 Resistance * Friction *0 Lead & Silver Soldering Brazing Compounds * Glueing & Cementing *+#0 R.F. Heating + Grinding, Abbrading, & Polishing *+#0 Hardening *# Normalizing * Tempering *# Annealing *#		Compacting Powders Parts-Cutting Tools * Ore Preparation * Fiber Lay-up +#0		Etching *# Pulp Production + Pulverizing *+# Grinding *# Blanking *+ Sheering *+ Trimming *+# Crushing *#

were also discussed. Definitions for all of these items were included on the handout sheet the student had received earlier. Also at this time we attempted to bring in some of the advantages and disadvantages of products produced for powdered metal.

To conclude and satisfy the third-phase "curriculum experiences", we had the students produce some powdered metal gears using the press and a simple die made from an axle spline and side gear. We also introduced other compacted products, such as particle board and briquettes. The students were encouraged to test the products for physical and chemical characteristics and to submit a written analysis of their findings.

Now admittedly we do not have the testing equipment to carry this type of investigation to its ultimate conclusion. However, we did test as best we could by the destructive method in a vise with a hammer (tensile testing was accomplished by simply pulling things apart), and proceeded as best we could with the equipment available at this time.

We ran a post-test which was the identical test as was used for the pre-test and submitted it to statistical analysis. Since our test was of the teacher-made variety and the sampling was limited, we do not feel that our statistical conclusion could be considered very reliable; therefore we would be very reluctant to attempt any conclusion at this time. The only thing we did feel we might accomplish by this procedure was to give ourselves some direction and some basis for observations. We were looking for indicators as to what we had accomplished and what we had not accomplished. Also, we felt we might gain some insights into what type of student might benefit from our program. During the production of the design, we had discussed the student ability level necessary to deal successfully with this type of study. Unfortunately, we do not have enough information at the present time to draw any valid conclusions. More investigation will undoubtedly supply many of the answers to these types of questions.

Industrial procedures

Joseph A. Feasel

Automation and computer control are the passwords in industrial procedures today.

Let us set aside automation for a few minutes and review. You have all sat here patiently while my colleagues have elaborated on the first seven areas of our program. It is in this final stage that the entire curriculum presented is woven together into what we call industrial procedures.

Here is where all of the previously-acquired knowledge and skill is applied to the production of a product.

First let us familiarize ourselves with industrial organization. There are seven basic organizational areas: Personnel, cost analysis, marketing, finance, facilities, production and transportation.

Even though the organization has been divided into these seven areas, production is the only line function. All of the others are staff functions supporting the one line function production. For example, marketing is divided into marketing research, advertising, wholesaling, forecasting, packaging and design, and retail sales.

All of these are important in the total picture, but marketing research and forecasting are probably the only two that have some direct bearing on production.

Therefore, production is the main interest in an industrial studies program. The other areas are important only to the extent that they support production.

Taking a close look at production you can see that it is headed by the vice-president of production, answering directly to the company president.

Like the other areas, this area is divided into concepts, classroom experiences, and laboratory curriculum examples.

Let us quickly look through the areas under production with which we will concern ourselves. First of all, there are two staff functions: Production Research and Development, and Processes. These are in an advisory capacity. Those in the direct line are materials, tooling, production, quality assurance and maintenance.

Now that I have given you an overall view of this section of the program, let us examine the possibilities and a flow of events of implementation in the classroom.

Marketing is usually the start of the progression after the original conception of an idea. After it is proven that there is a need for a certain item, it would be routed to the production research and development department. Here the physical, chemical and manufacturing properties, discussed by Mr. Powers, would be of utmost importance in the selection of a material or materials.

While the design is being finalized, many outside factors, such as cost analysis, would have a direct bearing on the product. Once the material and design are selected, a prototype of the product must be made and tested to determine if it will meet its expectations.

At this point production processes must be designed to produce this product in the most economical manner.

Almost all processes are included in the five classifications (presented previously by Mr. Oetinger): Particle separation, particle size enlargement, etc. The method of obtaining the result of these processes is directly determined by the size and type of company producing the item. For example, a small job shop may perform a process like particle separation (for example, drilling a hole) with a simple machine tool like a drill-press, while a large company such as Hewlett Packard might perform the same process with a numerically controlled 3- or 4-axis milling machine.

After the staff functions have been completed, the line operations begin. Methods of handling materials such as getting them to and from the scene of operation must be planned.

Tooling is one of the most important facets for automated and for non-automated operations. Such things as jigs and fixtures, which are used to produce a product of better quality than the skill of the operator is capable of producing, must be designed to fit the production.

After all of these areas are coordinated, production can begin. We are all living in a fantasy world if we think we can have computer-controlled equipment in the classroom in the near future. But these areas can be and must be discussed if we are going to keep up with our educational objectives. We could not have what we have today without the reliability, accuracy and production speed brought about by automated systems.

After or even during production, quality assurance of the product must be checked. This might be as simple as a visual inspection or as complex as production equipment with built-in testing and correcting devices.

At this point marketing and transportation would take over with the distribution of the finished item.

Summary. One of the objectives of the industrial studies curriculum is to create in the student's mind that, "anyone who lives by selling his services – be he businessman or machine tender – must actively and continually upgrade his product or service if he would share in the general advance."

Yesterday's teamster had to learn to drive a truck.
Yesterday's dock laborer had to learn to use a lift truck.
Railroad brakemen had to learn to read.
The machinist is being replaced by an electronics technician.
The engineering graduate of 25 years ago did work that a computer now does faster, better and cheaper.
The doctor delegates routine testing and spends his time learning to make informed diagnoses.[1]

We must think of these things today for our students of the 1970's and 1980's.

We are concerned that the high school students become aware through the study of industrial studies, culminating in industrial procedures, that today's society is being challenged by a "knowledge revolution". To meet the needs of students, many new concepts must be learned and mastered.

A galaxy cluster of new concepts and vocabulary is concerned with the organization of industry. A second galaxy cluster of new concepts and understandings is arising out of automated production in industry.

The curriculum has a "hands on" approach to equipment so that learning by the student will be received by as many senses as possible... also, motivation of the student will be maximized.

The program becomes a lecture-laboratory program with problem-solving taking place with equipment in experiments.

The program follows this course of study:

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[1] Ylvisaher, Lenvik, "Jobs In Perspective – The Trend Is Up In Number and Class", AUTOMATION- July, 1966. p. 60.

(1) Sources of Power
(2) Energy Conversion Systems
(3) Power Transmission Systems
(4) Physical Properties
(5) Chemical Properties
(6) Manufacturing Properties
(7) Industrial Processes
(8) Production Procedures

The program culminates with the organization of an industrial manufacturing plant to produce a product. The organization may be at any level of production. However, planning for mass production or automation would be the goal. In shops today, automation would be simulated rather than actual.

The concepts will be applied throughout the development of the course.

Summary of outcomes. (1) The program would be general education for youth about to enter a highly technological society of 1970-1980.

(2) This program should provide guidance and rationale with emphasis on how to live in an automated society.

(3) This program should make clear to the student that through the aid of tooling - jigs and fixtures, automation - a product can be produced which is above the quality level of that which an individual craftsman can produce.

(4) The program has an organization: A scope and sequence.

(5) The program develops a technological vocabulary and concepts.

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Discipline structures and processes—a research design for content and method

Paul W. De Vore

Introduction. Until relatively recent times the field of industrial arts developed its curriculum in a rather eclectic fashion based more on individual insight and interest than on research with measurable results. Fortunately, the last decade has witnessed a decided effort on the part of many individuals to carry out rather rigorous research projects in an attempt to establish a valid curriculum approach.

There has been a decided shift in the way the questions are being framed and a recognition of different bases for the selection of content. This has been brought about mainly by the exponential development of a phenomenon not yet clearly defined, namely, technology. The recognition of this phenomenon by the field of industrial arts dates to the late 1930's and to the work by William E. Warner and others at Ohio State University.(20)

With the exception of some present curriculum efforts and the early efforts at Ohio State University, there have been no curriculum designs which evidenced a recognition of the phenomenon of technology and its primary companion, change. We do find some interesting information when we review the efforts by the profession in the area of curriculum and relate them to the development of technology, however.

The investigations by Dr. Kenneth Brown (7) of State University College at Buffalo identify three themes upon which curriculum efforts have been based. The first is the Manual Training-Vocational Lineage. This concept, according to Brown, is European in origin and focuses upon the village trades of nineteenth-century Europe. The curriculum is based on the mechanical trades, oriented to the past and what has been and pursues the central theme of student discipline, manipulative skills and job performance.

The second theme is American Industry. This is American in origin and focuses upon the elements of American industry in varying ways depending on the curriculum worker's point of view as to what constitutes industry. The curriculum has as a central theme understanding the organization and operation of industry. It is oriented to the eternal present and what is.

The third approach is the Technology of Man approach. This approach is American in origin, focuses upon the fundamental tenets of technology and the universal technological endeavors of all men regardless of national origin. It is oriented to the future and what is to be and pursues the theme of technological literacy and effective functioning citizens in a technological society.

Further insight into the problem can be gained from a study of the history of technology. The history of technology identifies several dominant ages, together with the areas of advancement, which determine the nature of technology in each age, such as elements related to production (tools, work skills, materials and power), transportation and communication. Each technological age shows decided changes in each of these elements. The ages are: The Modern Craft Age, dating from approximately 1000 AD to 1784; The Machine Age, dating from 1785 to 1869; The Power Age, dating from 1870 to 1952; and the Cybernetic and Atomic Age, dating from 1953 to the present. (1,p.336-7)

If we note the changes in one area determining the nature of technology for a given age, we discover a serious problem in our basic assumptions. For instance, work skills have evolved from the Modern Craft Age, where they can be best described as all-around skilled craftsmen and unskilled manual workers using wrought iron and wooden tools, to the Machine Age, where subdivided manufacturing processes replaced skilled craftsmen with machine operators using machines made from wrought iron and steel, to the Power Age, where the feeder or operator was replaced by a skilled inspector serving multiple machine tools and automatic machines, to the Cybernetic and Atomic Age, with its highly-trained engineer-designers, skilled maintenance technicians, systems specialists and programmers serving cybernated factories typified by computers and closed feedback control loops. (1,p.336-7)

Similar developments are evident in the evolution of the other determiners of the ages of technology, namely, transportation and communications.

A recent status study by Marshall Schmitt (18) indicates that industrial arts content is largely exemplified by courses in woodworking, metalworking and drawing which at best can be said to be representative of the Machine Age which passed out of existence in the post-Civil War era, 1869.

It is abundantly clear that in an age characterized by an intellectual technology, the majority of our programs are based on concepts which existed over one hundred years ago during the craft and machine ages long since past.

This identifies the problem and sets the stage for meeting the objective of this session: the identification of needed research and proposed approaches for developing curriculum in industrial arts.

Establishing the base. There are a number of basic or primary areas requiring attention by researchers concerned with curriculum in the industrial arts. First and foremost is the establishment of a philosophical or theoretical base. Bob Brown discusses this at length in his book The Experimental Mind in Education. He states:

> To be intelligent or imaginative or exciting, practice must be deliberately related to theory. Failure to make this vital connection between theory and practice is a glaring weakness in American Education. (6,p.7)

Unless we establish a clear and concise theoretical base, it is difficult to see how we can navigate with vision. For those concerned about a theoretical approach versus a practical approach, it should be noted that in the long run the theoretical approach has always been the most practical and that all major advances are founded on some theory, hypothesis or assumption. Also, unless we approach the task from a stated philosophical or assumptive base, we have no valid means of identifying our dependent and independent variables so essential to evaluating our efforts.

The establishment of the theoretical base will require historical research to achieve what Hutchings (15,p.6) calls "critical distance." One way of attaining this perspective, according to Hutchings, is to achieve a knowledge of tradition. He states:

> If we cannot be sure where we are going, we can at least find out where we have been; we can discover in the reflections of our greatest predecessors suggestions about where we might go and what the advantages or disadvantages of going one way or another may be, and we can try to exert ourselves as intelligently and resolutely as possible in the direction indicated by rational inquiry and debate. (15,p.6)

There have been very few research efforts in our field directed toward the establishment of a sound philosophical base at a level of sophistication that stands the test of time. The basic question is: "What is the function of industrial arts in the educational system?" There seems to be a lack of "total configurational awareness." (16,p.26). The wrong questions are being asked, such as: "Where does woodworking fit in?" or "How can we make the National Aeronautics and Space Administration endeavors fit our already-existing subject-matter divisions such as metalworking, graphic arts or ceramics?"

The success of our research and the identification of dependent and independent variables will correlate directly to our efforts in the identification of our assumptions about the nature of man, society, education and the purpose and function of the study of industrial arts by youth.

The question is not easily answered, and there will be disagreements as Theobald notes. There will be:

(1) Disagreement about the facts and the interpretation of the facts.
(2) Disagreement about trends and the interpretation of trends.
(3) Disagreement about the constraints imposed by the environment.
(4) Disagreement about the nature of man.
(5) Disagreement about a desirable world in which to live. (19,p.7)

These issues have not been clearly drawn. Our profession seems to have perpetuated a myth that we all stand in the same philosophical corner. But this is because our level of discrimination has been low or we have not been willing to engage the rigor of the task. All of us are not standing in the same arena and striving for the same goals while using different approaches. There are basic philosophical value judgments which must be made. And it is upon these bases that research designs must be developed.

A Research Position. Fundamental to the proposed curriculum research are several basic assumptions. First, it is assumed that institutions exist to serve man as does the institution of education. Second, the central concern of education in a democratic society is man. Third, we live in a society dominated by technology; a society in a constant state of change. Fourth, our concern in a highly complex technological society, dependent upon the intelligent functioning of all citizens, must be the development of intelligent self-functioning individuals and not individuals trained for inflexibility in a world of fluid possibilities where the only goal of technology is the disemployment of human beings. (14, p.145)

For these and other reasons, it is necessary to reject the occupational, pre-vocational and industry bases for the development of industrial arts curriculum and reassert the philosophical base to be general education which is concerned with education and not training; long-term goals rather than short-term goals.

General education is concerned with the future, as is technology. Therefore, its major theme is: education in the conduct and strategy of inquiry itself. (4,p.157) It is concerned not only with perpetuating what others have created or developed but also the development of individuals capable of discovering new concepts and of functioning in the processes of the disciplines and their unique ways of knowing, doing, acting and thinking.

The concern is for man and his needs as a flexible adaptive individual in an unpredictable but human world. It is a concern for society and the disaster of uneducated citizens or citizens trained for an age long since past.

Our research, therefore, must focus on four areas of endeavor: (1) establishment of a discipline base together with the identification of its knowledge structure and established facts, principles and concepts as a basis for providing the student with the means of functioning in the present; (2) the identification of the processes of the discipline to provide the student with the basis for performing effectively in and adapting to the future; (3) the identification of functional interrelationships with other disciplines as a base for developing the capacity of students to comprehend the larger problems of man and society; and (4) the identification of the social/cultural relationships to provide a base for making intelligent decisions about the utilization of innovation and invention in the sciences and the technologies.

A Discipline and Knowledge Base. There are a number of reasons for the development of a curriculum structure from a discipline and knowledge base.

First, it is fundamental that inquiry is the basis of general education, and disciplined inquiry is the basis for progress. Second, there is general support from curriculum workers such as Foshay (11,p.3) that educators should take directly into account the nature of the organized bodies of knowledge.

In fact, not only are the organized bodies of knowledge useful in providing a focal point for curriculum research, but also they provide the base for determining the working methods of the practitioners of the disciplines (17,p.48), which provide insight into the solution of problems related to educational objectives and methodology, both areas of considerable confusion.

It becomes evident, if educational objectives are to relate to reality in any but a vague way, that objectives must be related to what man does and to specific identifiable bodies of knowledge and disciplines and their content structures together with the intellectual processes of the discipline including modes of thinking and performing. This approach separates the objectives of education from those of schooling which vary from locale to locale and country to country. The former, educational objectives, are the province of the practitioners in the disciplines and specialists in education, while the latter are the function of citizens and teachers at local levels. This view provides a possibility of attaining a unity of educational objectives while at the same time admitting a diversity of objectives related to schooling. (5,p.10-11) This distinction does not imply that one kind of objective is more important than another, but it does provide a separation of responsibility and function and give direction to research.

Each discipline has its own structure which has been created over the years by the practitioners of the discipline pursuing certain methodologies directed to the attainment of specific objectives. Therefore, not only are there objectives and methods related to the teaching-learning process, but also the discipline approach identifies objectives and methods of the area of knowledge being pursued. The latter are of prime importance in developing individuals capable of functioning in an age of constant change. They provide a base for structuring the learning environment and aid in the selection of educational objectives and teaching methodology. They enhance the relevance of the learning experience since they are based upon the actual activities and goals of the practitioners of the discipline. The entire approach is based on what people do and, therefore, is performance-oriented providing a valid base for measuring and evaluating the success of the educational enterprise. This is vital when it is recognized that as increased expenditures are allocated to education, public interest in cost effectiveness also increases. The question is: "From what discipline base does industrial arts identify its content and processes and related educational objectives?"

The Discipline Base – Technology. The entire base of society has changed due to man's creative endeavors in the technologies. A new era exists following man's implementation of his innovations in industrialization, automation and cybernation. Man has, for the first time, the possibility of creating for himself a truly human existence, provided he is educated properly to participate in this new life.

If man is to function effectively today and tomorrow in a democratic society dependent upon the intelligent participation of its citizens, then the phenomenon of technology must be understood in depth if man is to apply intelligently his accumulated wisdom to new conditions as they arise. Drucker (8,p.4) cites the need for a process and discipline approach as vital to the continuity of a technological society.

> What we will have to teach is, above all, ability to learn new things after one has left school, and yet we also clearly need people who have greater and more systematic knowledge in the various disciplines.

This focuses attention on specific research problems related to the design of educational programs and the preparation of teachers for these programs. Learning is a perpetual endeavor and requires an educational base which emphasizes (1) the intellectual processes and behavior involved in the disciplines, (2) the identification of problems, and (3) the solving of problems. The unity of knowledge, therefore, must be stressed, rather than fragmentation into highly specialized compartments. The relationships between technology and other bodies of knowledge must be taught because the problems of today and tomorrow require a multi-discipline approach for their solution.

In addition, attention must be directed toward those who will enter into an adult role immediately upon graduation from high school. They will participate in a constantly changing technological society exemplified by increasing abstraction and symbolism. They must be educated to the utmost of their abilities if they are to participate in a knowledgeable way, not as manipulators of technique but as functioning intelligent citizens in a changing society.

Clearly our research must be concerned with technology and the value questions raised by this phenomenon. De Carlo (19,p.66) questions the values traditionally inculcated concerning the values of work and the "work ethos" and states that these must be reappraised by educators and scholars responsible for education for the future.

All of these concerns have been brought about by the advancing technology which receives little or no attention in the public schools. Upon examination, however, we discover that the discipline of technology, which is future-directed and concerned with what is to be, does provide questions for our research related to both content structure and methods. Developments in technology stress:

(1) Individual involvement and active participation.

(2) Innovation and creation, which are essentially human activities, as opposed to

implementation, which is capable of being performed by machines.

(3) Active approaches to problems and the utilization of many disciplines rather than passive learning in closed situations.

(4) Real problems relating to man and his physical and social environment.

Emphasis is, therefore, placed on problem-solving and the methods of attacking problems and using knowledge, rather than on problem-doing which places the emphasis on studying a body of knowledge for its own sake and dealing with problems already solved. Change is inherent in the discipline and is recognized as a human function with the implication that educational programs must be designed to educate for change, not only to prepare individuals for the future but also to serve them as truly human beings at present.

Research must then focus not only upon the knowledge and content structures of disciplines, as they already exist, but also be concerned with the identification and structuring of the processes of the knowledge areas; processes which relate to solving problems through the use of knowledge and information and those which relate to adding new information and knowledge to the discipline base. This is based on the assumption that an intelligent functioning and adaptable individual is one who has mastered the content of the disciplines and has been directly involved in the processes as well.

Process as Content. Some years ago, 1962 to be exact, I stated that our goal in curriculum research should be to develop a curriculum structure which would exhibit the qualities of being externally stable yet internally flexible and adaptable to change. Then, as now, the concern was with the phenomenon of technology and its effect on man and society and the responsibility of the industrial arts as part of general education in designing an educational program which truly meets the needs of youth and society.

The significant factors which have directed attention to the validity of the concept of process as content are three: (1) That the primary function of general education is the development of inquiry, (2) that we do not now nor ever have lived in a stable state society and (3) that knowledge is not developed in a straight line; it is a network. It is evident that everything is in process, nothing stays still and the future will be different from the past.

We live in an unstable society and must develop educational programs which provide students with security in a changing world. The process approach seems well suited to this goal and the goal of a stable curriculum structure with internal flexibility.

The task for researchers and teacher educators will not be easy because our efforts have been based primarily upon the concept of a stable state society. Our curricula support this point of view as does our teaching methodology. Our programs are organized in terms of specific content, facts, principles and concepts about crafts, trades, industry or technology depending upon one's point of view.

This is so because we have long held that things don't change, or at least not too much, and that the fundamentals of yesterday and today will be valid tomorrow. We deny the true nature of technology, which is dynamic, constantly changing and directed to the future.

Our approaches deny the lessons of technological history and fail to provide justice to those we teach. These approaches subvert the human element and place little faith in the worth and intelligence of human beings.

The process approach requires we give up our "quest for certainty" with its false security and seek security through the on-going, constantly-searching procedures of the discipline. This will be in keeping with the phenomenon of technology, which is always changing and creating new realities.

Our research efforts then must be directed toward the study of what technology does and how the practitioners of the field go about their business, together with the determination of the particular methods, basic principles and concepts. We need to investigate the rationale and procedures developed by man in solving technological problems. We must determine whether processes such as postulating, deductive reasoning, verifying by empirical methods, inferring, proving, discovering and other methods are valid means of dealing with technological principles and concepts.

We need to identify the system of technology as do our students. In fact, both teacher and student must become learners together and pursue activities related to what those in the technologies actually do.

The research procedure whould approach the problem from a systemic point of view, thereby identifying the discipline and its processes as a general interrelated hierarchical system. If the philosophical research identifies the discipline base as technology, then the inquiry can be directed by the following questions:

What is the "discipline" of technology?
(1) What does technology do?
(2) How does it accomplish it?
(3) What tools, systems, procedures has technology matured?
(4) What can one do with technology – with its fund of documented information and with its methods of inquiry?

What kinds of subject matter (or content) are found in technology?
(1) What laws, principles, generalizations, conclusions?
(2) What procedures for deriving these laws, principles, generalizations and conclusions?
(3) What interpretations and applications of the laws, principles, generalizations and conclusions?
(4) What procedures for making interpretations and conclusions?
(5) What unsolved problems, unanswered questions, and unknowns still confront technology?

What questions does technology ask? And, of whom, or what, does it ask them?
(1) How are the questions derived?
(2) What forms do the questions take?
(3) How is the relative importance of different questions determined?

What is the "structure" of technology?
(1) What aspects of technology can be applied to other learning?
(2) What fundamental ideas about technology make it more comprehensible?
(3) What facets of technology bridge "elementary" and "advanced" ideas?

How does technology –
(1) Reduce to practice?
(2) Discover and verify knowledge?
(3) Move from raw data to structure and conclusions?
(4) Find criteria for estimating the quality of evidence?

How does the technologist function? And, what effect does his labor have on –
(1) The behavior of people?
(2) Civilization and culture?

(Adapted from Parker - 17,p.23-24)

Research based on these and similar questions will provide a base for establishing a curriculum structure which is not only externally stable and internally flexible and adaptable to change but will also provide answers to questions related to: (1) objectives, (2) sequencing of instruction, (3) interrelationship of content, (4) methodology, (5) designing units of instruction, (6) individualizing instruction, (6) assessing student achievement and (7) designing the learning environment.

The processes of the discipline are the content, and the objectives are derived from the doing aspect of the discipline. They therefore are performance-oriented. And as Gagné (13,p.4-8) explains, the identification of the process hierarchy from the simple, concrete and specific to the complex, abstract and general activities of the discipline provides a solution to the development of instructional units and the sequencing of instruction. Also, the ever-confusing question of methodology becomes clearer. After years of research reporting no significant difference, we discover that the methods of the discipline and the content are not separate and distinct but continuous and unified as Dewey proposed years ago (6,pp.48 and 66).

The development of research designs with the goal of identifying the discipline base with its unique structure, content, principles, concepts and processes provides a valid means to identify stable yet flexible structures, dynamic content based on reality, valid measurable objectives, methodology, teaching strategies, procedures, questions and problems integral to and consistent with the discipline and therefore supportive of the goals of education. All of these can be identified from identifiable bodies of knowledge in the technologies. Furthermore, the performance base enhances the solution of the ever-present problem of student assessment and program evaluation. The processes to be identified will be based upon the activities of the practitioners in the discipline. Programs are, therefore, performance- and behaviorally-oriented, as is technology. Thus, the student and the program, including the teacher, can be evaluated in performance terms without violating the essential nature of the discipline.

Recommended Research Procedures. The proposed research procedure involves research related to four fundamental questions. Whom to teach? What to teach? When to teach it? How to teach it? The following design incorporates the wholistic or systems point of view.

The design not only requires the use of experimental studies and the identification of dependent and independent variables but also requires, for certain data-gathering stages, research incorporating case studies, biographical studies, anthropological studies and historical studies. The design follows the general processes utilized by all disciplines as they go about their business, namely, observing, collecting data, classifying, analyzing, synthesizing, applying to practice and evaluating. The continuum ranges from one of value judgments, determining what is to be and knowing that, to implementation, determining what is effective and knowing how.

An outline of the research design involves three major stages and their several activities. Stage I is concerned with the questions: What to teach? and to whom to teach it?

A. Identify the philosophical base. Establish criteria to determine the priorities to be given to various points of view. (What to teach? Who to teach it to?)
B. Determine basic assumptions about man, society, education and learning. (Who to teach it to?)
C. Identify from the philosophical and assumptive base the goals and objectives of the curriculum. (What to teach? Who to teach it to?)
D. Identify and state the criteria for development of the content structure. (What to teach?)
E. Identify the discipline base together with the central themes and tenets of the discipline. Determine what it is and what it is about. (What to teach?)
F. Determine the best classification or taxonometric structure for the discipline base and the sub-elements. Evaluate the choice in terms of the criteria in item D. (What to teach?)

Stage II is concerned with the questions: What to teach? and When to teach it?

A. Using the discipline classification, establish the known facts, concepts, principles, theories and laws of the discipline and arrange them in a hierarchical order. This establishes the present state of the discipline, answers the question what is, and identifies learning levels and sequences. (What to teach? When to teach it?)
B. Identify the basic processes of the discipline. This concerns the modes of thinking, doing, performing and the ways of adding to the discipline to accumulate new knowledge and processes. It establishes the procedures, questions and problems of the discipline and the ways of securing, evaluating and using data and information to advance the discipline. (What to teach?)
C. Determine the hierarchical order of the processes of the discipline. This establishes the learning levels, levels of discrimination and sequences for learning and answers the question: When to teach it? Processes aid the discipline in answering the question, what is to be, and provide a means for the curriculum to adapt to change. (When to teach it?)
D. Identify, within the discipline structure, the functional relations existing between the various facts, concepts, principles, theories and laws, the different processes of the discipline and the relationships of these to other disciplines. This establishes the relationship between learning within the discipline and with other disciplines within the area of general education. (What to teach? When to teach it?)

Stage III is concerned with the questions: When to teach it? and How to teach it?

A. Identify the objectives of the discipline. (When to teach it?)
B. Identify the learning levels and sequences for the established content and processes of the discipline. (When to teach it?)
C. Develop resource units incorporating the activities of the discipline for each of the several areas of content and the processes of the discipline. (How to teach it?)
D. Identify, from the processes of the discipline, suggested methodology and teaching strategies. (How to teach it?)
E. Identify and state the instructional objectives. (When to teach it? How to teach it?)
F. Design teaching-learning units utilizing data from (C) and (D) above together with data and information from the social and psychological sciences on human development and learning theory. (When to teach it? How to teach it?)
G. Design several curricular models for the purpose of identifying the most valid approach to meeting the stated assumptions, educational objectives, discipline objectives and instructional objectives. (When to teach it? Who to teach it to?

When to teach it? How to teach it?)

H. Apply the curricular designs to practice and field test.

I. Evaluate each model, using, as criteria for measurement, the stated assumptions, educational objectives, discipline objectives and instructional objectives.

J. Select that model which best meets the measurement criteria and develop total system.

K. Implement system and continue evaluation and reassessment.

Conclusion. If the discipline base is man's creative endeavors in the technologies, the curriculum should reflect the central themes, activities and methods of the discipline, including the procedures, problems, objectives and questions of the discipline. These can best be determined by research directed toward the determination of the processes of the discipline.

The advantage of this approach is that the outcomes of the program can be stated in human performance terms, since the processes are doing-oriented and based upon the activities of the practitioners of the discipline. Evaluation can, therefore, be based on objectively determined and measurable outcomes.

By basing our research and resulting curriculum structures on observable, verifiable, and objective outcomes, we enhance the possibility of unity in goals, yet allow a range of flexibility and diversity of programs to determine the most human, economical and efficient means of attaining the objectives of instruction, namely, what the individual will be doing when he has reached a given level on the learning (process) hierarchy.

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The systems analysis approach to industrial arts content

Lewis W. Yoho

Introduction. This presentation will be confined to the boundaries identified by your program chairman. The specific terms of those boundaries are identified by the following quote from his instructions. "It should be pointed out that the purpose is not to learn what content you have selected, nor what method of teaching you support, but rather, what is this approach to selection and identification of content and how may one use it to advantage in industrial arts? .... it will be appropriate to consider research approaches."

Treatment of the topic under the limitations imposed will include, in addition to the introduction and summary, four parts, as follows: (1) Definitions and Development of the System Concept, (2) Basic Curriculum Theory, (3) Application of System Analysis in Identifying Content, and (4) Delimitation and Selection of Content.

Definitions and concept development – Systems. Many definitions may be offered, and some variety is useful for concept development. Dr. Charles DeCarlo (3) of IBM defined a system as "a set of things or objects associated so as to form a complex unity." Stafford Beer (1) defined the system in brief form as "a name for connectiveness." An adaptation of his discussion of the system is as follows:

> Anything that consists of parts connected together may be called a system--- an automobile, an economy, a billiard game, a conference, etc. ---. These things are aggregates of bits and pieces which become understood only when connections between the bits and pieces and the dynamic interactions of the whole organism are made the object of study.

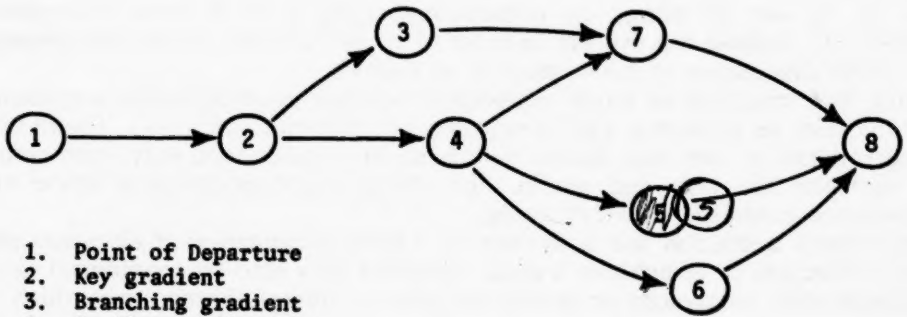
A generalized definition for a system is a total combination of elements necessary to perform a function or to achieve a goal. Systems may also be considered as coherent patterns identifiable as thought or mental images or mental abstractions which have potential for use in learning and in transfer of meaning. As an example, one may develop mental images of industry or of man as energy exchange systems, or as information processing systems, or as resource conversion systems, or as social systems, etc. The arbitrary definition gives direction for the mental images and concepts formed. For application and practical use the system must be specifically identified and arbitrarily defined. Facility in identification and definition of systems renders the system a useful unit for analysis.

Systems models. If coherent patterns are identifiable as thought or mental images and can be described by specific arbitrary definition, the recorded images or abstractions are the visual models. The processes of creating the mental images and the act of recording them as models are mutually reinforcing to each other and together constitute highly creative and generative activities.

Systems models may be generally defined as simplified abstract diagrams, networks or flow charts which reveal explicit descriptions of all action, and which also provide for rational ordering of alternatives in terms of feasibility and economy in the achievement of identified goals. The systems model is an abstract isomorphic representation of the functioning system. (It may be helpful to consider the analogy of the common road map, which is a model of our road and highway system. The useful road map may be selected by the arbitrary definition of the state or region desired.) Many types of models are in common use. The more sophisticated models described by Stires and Murphy (8) are employed by government officials, industrial management, scientists and mathematicians to achieve optimization. In addition to optimization, models are useful for purposes of decision-making, trade-offs, resource allocation, spanning into the future, critical thinking, alternatives evaluation, global vision, strategy planning and control evaluation. Choice of an appropriate model may be made from a variety of model possibilities identified by such acronym titles as the PERT, CPM, PEP, AGREE, RAMPS, PACE, LESS and PACT. Most models for business or scientific use are designed with pyramidal dynamics for discrete goal achievement; therefore, the SNAP MAPS (Systems Network Analysis Process Maps) were suggested for educational strategy planning and curriculum development where the dynamics are generally cyclical and the activity and goal attainment are continuous rather than discrete.

The network modeling analysis process. The network modeling process should start with the concept of a linear scale which has the goal or terminal-result on one extreme and a point-of-departure on the opposite extreme. These extreme points must be sharply defined such that attention naturally moves to concern for the intermediate gradients or sub-goals. Identification and placement of intermediate gradients seems to follow no particular formula; rather, it is a mental creative process of finding the bits and pieces, and of "teasing" them into position for best fit in the overall pattern. Criteria for placement include order, relationship and flow. Gradients, or sub-goals, may have various types of relationships describable as parallel, in-line branching, key and dependent. The space or linear dimension between the point-of-departure and the terminal-result should be considered as having gradations toward the goal. This concept of gradation or goal gradients is helpful in forming the mental images. Flow lines added to the gradients should set all relationships and leave no dangling gradients. All gradients must contribute to the terminal-result or goal. The described modeling process is illustrated in the following figure.

Modeling Process Example



1. Point of Departure
2. Key gradient
3. Branching gradient
4. In-line gradient
5. & 6. Parallel gradients
7. Dependent gradient
8. Goal

Figure 1

Curriculum theory. Systems analysis as defined and described is a potential tool for the educator's use with curriculum problems. In some ways it is more than a tool: It is a new way of thinking, and these two features of systems analysis should be considered and tested. Therefore, to promote discussion and evaluation, it is hypothesized that the older tools and techniques used by educators for determining instructional content, curricular patterns and instructional strategy can be challenged as becoming inadequate for dealing with the avalanche and variability of content and knowledge extruding from the technical domain of society.

Armed with new tools and new ways of thinking, several basic systems may be identified as alternative sources for the unique content of industrial arts. The strategy of the systems analysis approach involves analysis of the arbitrarily-defined basic system into its several levels of sub-systems which contain the specific content. As a common approach, this process could also be applied for any content area.

Some alternative basic systems include the industrial system, the economic system, the social system, the educational system, the technological system, the human life system, etc. Several curriculum theorists seem to agree that the curriculum builder must concern himself with life itself as the basic source or system. The following quotations are offered in evidence:

Alfred North Whitehead (4) in Kaiser News: "The solution I am urging is to eradicate the factual disconnection of our subjects which kills the vitality of our modern curriculum. There is only one subject matter for education and it is life in all its manifestations."

Ralph W. Tyler (9) in September, 1966, Phi Delta Kappan: "I now think it is important in curriculum development to examine the concept of the learner as an active purposeful human being."

Ross Mooney (7) in the Ohio State University TIP Magazine: "Those who are struggling with curriculum have experienced failure in older frames of reference---There is an underlying rebellion against the 'death-dealing' and a complementary search for the 'life-giving'. More unwittingly than wittingly --- persons have been taken as instrumental to institutions and institutions have been taken to have prime value! But now the realization is dawning that institutions we have created may be taking us in the direction of death; war escalates; so does mental illness; so does crime and racial strife; so does starvation and poverty. Conditions seem organized to get worse! ---- We are becoming aware that we shall consciously have to build systems for delivering 'life' to mankind. The curriculum builder is a person now seeking to find a way of 'life' in himself that he may have the basis, also, for a way of life, through education for his fellow man."

Walter Guzzardi (5) in Kaiser News: "The greatest psychic gratification, ego satisfaction, comes when succeeding in making changes of important kinds in one's institution ---- the process of making change he calls 'creating something' and creating something is a central aim of life."

Dwayne Huebner (6) in Ohio State University TIP Magazine: "Man is a transcendent being, i.e., he has the capacity to transcend what he is, to become something that he isn't. In religious language this is his nature for he is a creator. ---- he participates in ---- the continued creation of the world. ---- (participates in the man-world system of creation). ---- This postulated category points to the fact that man is a temporal being, whose existence is not given by his occupation of space, but by his participation in an emerging universe. One form of man's response is his understanding of himself in the moment-of-vision as he projects his own possibility for being in terms of the 'having been'. Man's world responds by withholding or giving, yielding or resisting, punishing or criticising, and supporting or negating. This is the dialectic, leading to the continual creation and re-creation of man-in-the-world.

"The responsibility of the curriculum person is to design and criticize specialized environments which embody the dialectical relationships valued in a given society. ---- These environments must encourage the moment-of-vision, when the past and the future are the horizons of the individuals present so that his own potentiality for being is grasped."

Huebner's position seems to be an elaboration and further development of the several positions quoted. Figure 2 is a schematic interpretation of the temporal span of life.

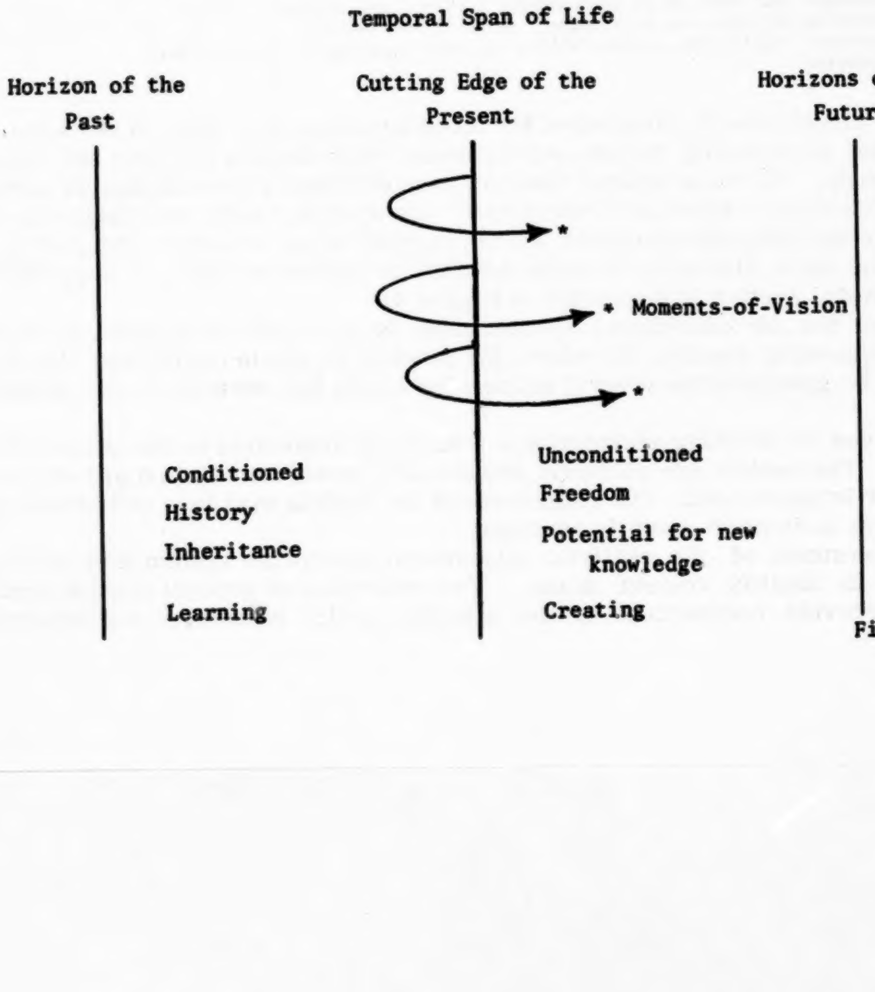


Figure 2

Agreement with Huebner's position regarding the responsibility of the curriculum person demands a different approach to content and curriculum construction. Identification of the "body-of-knowledge" by its very nature is in the area of history; it deals with the "horizons of the past". This is only part of the curriculum problem; the "horizon of the future" also must be incorporated into the system.

Content identified and pre-determined for the students' acquisition would be supported by an assumption that the human being is basically an inheritor, and that his inheritance may be acquired. This may be held in contrast with the assumption that the human being is basically a creator and that he must construct new knowledge and experience. The more defensible position is probably a combination of both, in which his potential for creating is derived or stimulated by his inheritance.

The systems models can serve as bridges to the future to connect schematically the "horizons of the past" to the "moments of vision" of the future and give the individual a grasp of his opportunity for creating and change-making.

Application of systems analysis for content. The arbitrary definition of life as the "human-life-system" activates mental imaging, and the modeling may proceed. The "human-life-system" seems to have support from curriculum theorists and also seems to incorporate all other alternatives.

What is the "human-life-system" which places man's ultimate purpose as a creator and provides an inheritance which stimulates and assures a continuing creation?

Many images may be generated, but one alternative is offered as an example in Figure 3.

SNAP MAP of "System-of-Human-Life"

(First Level)

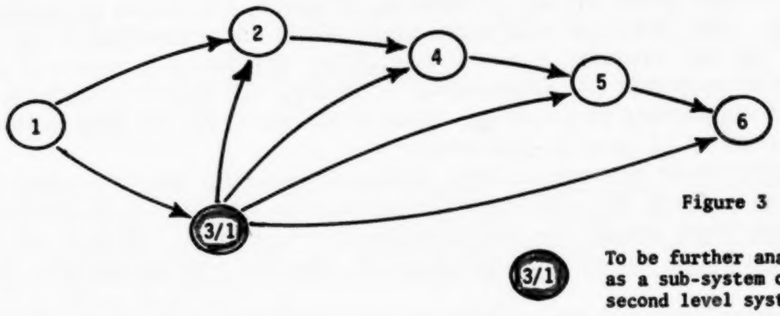


Figure 3

To be further analyzed as a sub-system or second level system

1. Birth into society
2. Engagement into inherited environment, society, and culture
3. Engagement with catalytic educational enterprize
4. Dialogue and reaction to environment, society, and culture
5. Creating and changing environment, society, and culture
6. Creator: fulfilling responsibility for participating in the continual creation

The base model sets the foundation for all other curricular work in any area, for the process is that of analyzing for the sub-systems which delimit the area and identify the content for study. We must assume that our area of direct responsibility is already defined as the "catalytic educational enterprise" sub-system, and we may begin the concept development of the educational system which operates in our society. The goal is identifiable from the basic life-system model but may be further refined. A suggested model for the educational system is presented in Figure 4.

The model for the educational system must be a simplified abstraction of the very complicated operating system; therefore, for productive use in curriculum development, models must be generated on several successive levels for attention to the specific content.

The process of deriving instructional content is illustrated by the series of models which follow. The models are heuristic and should present stimulation and challenge for verification or improvement. The refinement of the models may be a continuous process as the challenge to improve them is accepted.

The sub-systems of the catalytic educational enterprise system may be conceived and modeled to identify content areas. Two examples of general content areas were modeled to provide comparison to the specific model of concern for industrial arts

SNAP MAP of The Catalytic Educational

Enterprize of Our Society

(Second Level)

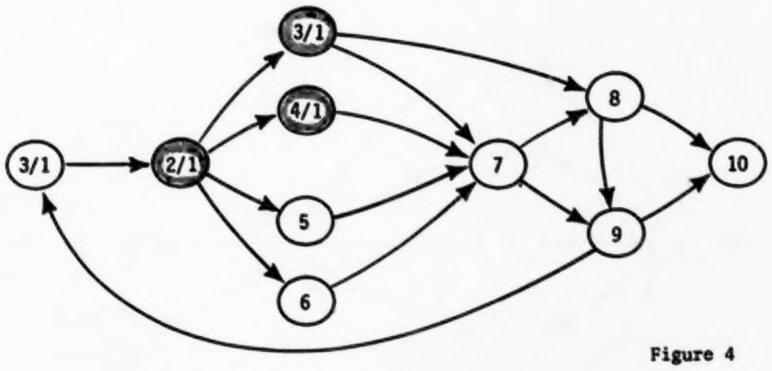


Figure 4

2/1 . 3/1 . 4/1 Selected for further analysis as sub-systems or third level system

3/1. Catalytic Educational Enterprize in our society
2. Education for competencies in communication
3. Education for competencies in Production and Consumption of goods and services
4. Education for competencies in Government and discipline
5. Education for competencies in perpetuation
6. Education for competencies in continuing the culture
7. Education for Life purpose and the continuing creation
8. Education for competencies in reckoning with forces of time, space, chemical, physical, economics, and social factors
9. Education for reconstruction and projection of society
10. Creative responsibility culminating in the good life with dignity, capacity for responsible freedom and independent action

content. Figure 5 is the proposed model for the "communication" sub-system.

The model for the "communication" sub-system is identical with the "government-discipline" sub-system model, only the gradients differ as identified in the following:

4/1. Education for competencies in government and disciplines
2. Family "apprenticeship" in discipline
3. School governing structure and school curriculum including civics, politics and law
4. Experience contacts with city government
5. Experience contacts with county government
6. Experience contacts with state government
7. Experience contacts with national government
8. The sub-goal of general societal competence in the government-discipline functions
9. Military training and experience for occupational proficiency
10. Law school for occupational proficiency in law
11. College and university curricula for occupational proficiency including politics, criminology, foreign relations, etc.
12. The goal of vocational societal competence in government and discipline including teacher, lawyer, politician, diplomat, warden, officer, etc.

The design and configuration of the model presented in Figure 5 sets a general pattern for all models on this third level. Probably the most significant feature of the models is the exposition of the vocational competency aspect which inevitably follows the general competency features. The varied nature of individuals causes some to discover special talents and interests as they develop their general competencies. It is obvious from examination of the models on this level that many educators who are not generally classified as vocational educators are actually involved in forms of vocational education.

The sub-system of direct concern in regard to industrial arts is "education for competencies in production and consumption of goods and services". The proposed model is presented in Figure 6.

SNAP MAP of the Education for
Competencies in Communications
(Third Level)

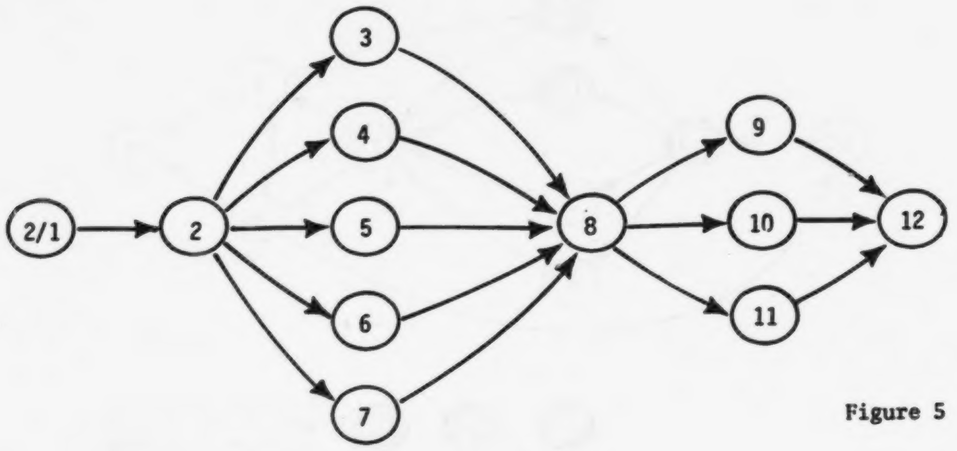


Figure 5

2/1. Education for competencies in communication
2. Family "apprenticeship" in communicating
3. Theatre and the arts
4. Music, poetry, and Literature
5. School Curriculum including drawing, art, speech, and photography
6. The mass-media including T.V., radio, newspapers, books, magazines and telephones
7. Professionals organization including conferences, convention and discussion
8. The sub-goal of general societal competence in the communication function
9. Art institute for occupational proficiency
10. Theatrical Schools for occupational proficiency
11. College and University curriculum for occupational proficiency including speech, language, TV, radio, music, and art
12. The Goal of Vocational Societal competence in communication including teachers, actors, singers, announcer, interpreters, writers, etc.

Each subsystem of each successive model provides for consideration of alternatives, and forces specific definitions.

Some feature of the proposed model includes the elimination of the apprenticeship function as a key gradient for competency goals. Traces of apprenticeship remain in some areas, but the departure from apprenticeship places greater responsibilities upon the educational system. The model reveals areas of general competencies which all members of society should develop. In respect to the general competencies and to the vocational competencies, the model is identical to the previous examples, but some important differences in details do appear.

The model illustrates a comprehensive array of experiences and understandings important for the individual. Just as illustrated by previous models, individuals who discover personal interests and talents should have opportunity to develop further into the vocational competency level.

The "consumer goods manufacturing" sub-system or goal gradient was selected for further analysis to illustrate progress and procedure toward specific content. The subsystem model is presented in Figure 7.

This fourth-level model is a generalized model of a manufacturing production system but may be converted to a more specific model once the product is arbitrarily defined. Instructional content and fundamentals underlie each of the goal gradients. Experience and understandings in these areas are important for all members of society if full potential of mental capacities and individual fulfillment are to be directed toward greater progress and greater efficiency in our productive efforts. The models at this level identify the broad areas for content and instruction in meaningful context and provide guidance for dynamic changing laboratory development.

Fifth-level models reveal specific content in tremendous volume but hold it in mean-

SNAP MAP of Education for

Production and Consumption of Goods and Services

(Third Level)

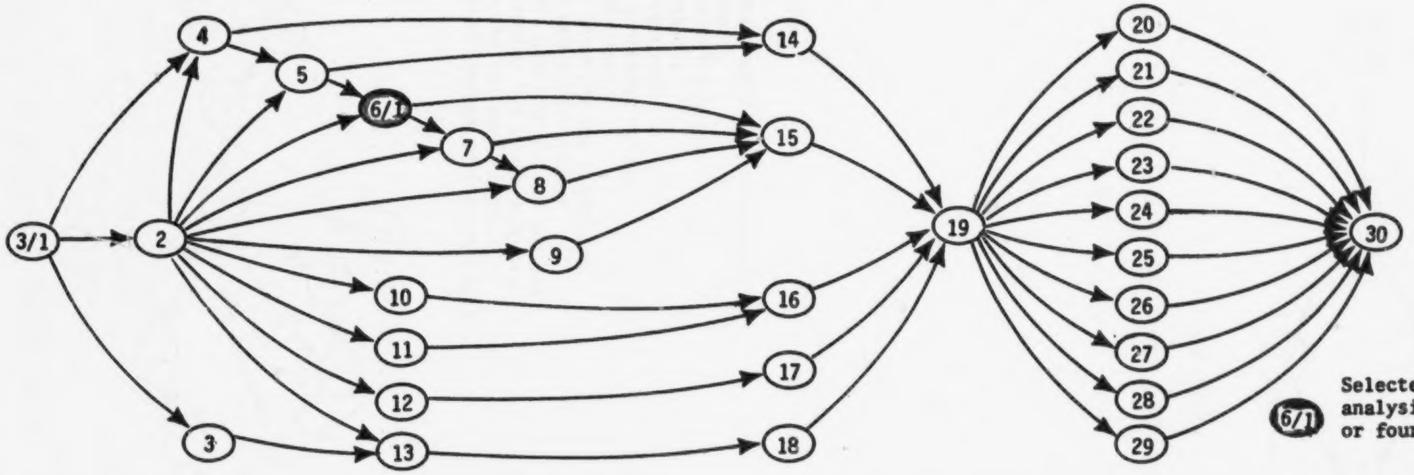


Figure 6

6/1 Selected for further analysis as sub-system or fourth level system

3/1. Education for Production & Consumption of Goods & Services
2. Technical Communications for business and industry
3. Home "apprenticeship" in consumer functions
4. Extraction of raw materials technology
5. Technology of conversion of raw material
6. Consumer goods manufacturing technology
7. Construction technology
8. Servicing and Salvaging technology
9. Technical communication technology
10. Distribution, transportation and marketing technology
11. Business and financial services technology
12. Government services technology
13. Consumer technology for home, institutions & personal services
14. Extractive, stock, and utility conversion Technology or arts
15. Communication, Construction, Production, Service, and Salvage Technology or Arts
16. Marketing & Management Technology or arts
17. Public and Civil Service Technology or arts
18. Home & personal service technology or arts
19. General societal competency goal for production & consumption of goods & service
20. Extractive, stock & utility conversion occupational cluster
21. Consumer goods manufacture occupational cluster
22. Construction industries occupational cluster
23. Service industries occupational cluster
24. Salvage industries occupational cluster
25. Distribution, Transportation, and marketing occupational cluster
26. Business and financial occupational cluster
27. Governmental services occupational cluster
28. Personal services occupational cluster
29. Living, & Homemaking occupational cluster
30. Vocational societal competence goal for production and consumption of goods and services including teacher, craftsman, mechanic, operator, engineer, etc.

SNAP MAP of Consumer Goods Manufacturing Technology

(Fourth Level)

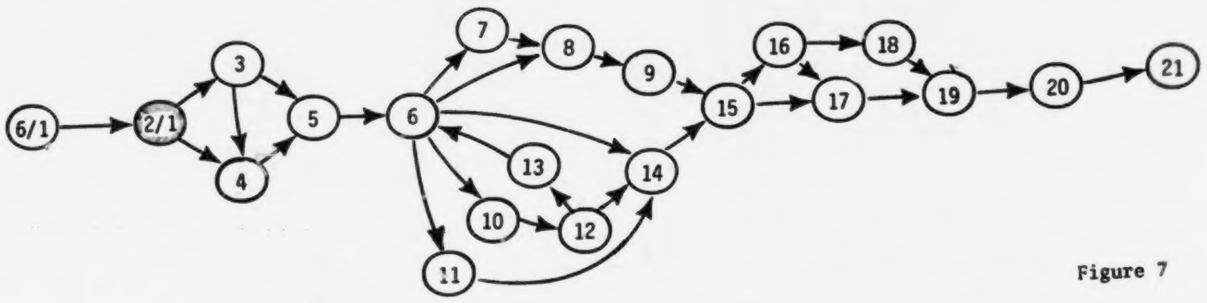


Figure 7

6/1. Consumer Goods Manufacturing Technology
2. Product Design and Development
3. Product Research and Experimentation
4. Design model Development and Testing
5. Production Model Development
6. Production Planning and Processing
7. Process Engineering
8. Plant and Equipment Layout
9. Materials Handling
10. Work Measurement
11. Maintenance and Service
12. Methods Study
13. Methods Improvement and Automation
14. Tool Up
15. Manufacturing
16. Quality Control
17. Parts Forming and Processing
18. Salvage
19. Parts Assembly
20. Packaging
21. Manufactured consumer product goal

(2/1) Selected for further analysis as sub-system or fifth level system

SNAP MAP of Product Design and Development

(Fifth Level)

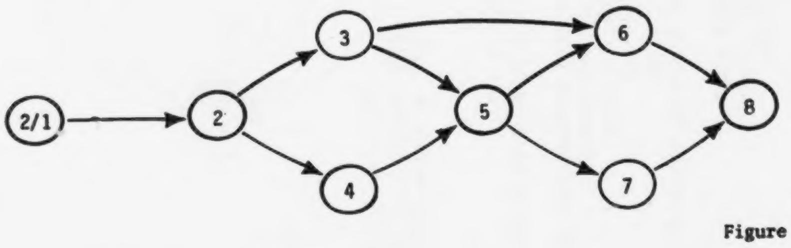


Figure 8

2/1. Product Design and Development
2. Search of Needs and Potential Uses
3. Generate and Identify Alternate Functional Solutions
4. Identify Suitable Materials
5. Generate Ideas for Combining Materials and Functions
6. Convert Ideas to Sketches, Illustrations, and Renderings
7. Decide on Product Idea for Development
8. Develop Working Drawings for the Product

ingful context by the network models. It should be noted that arbitrary definition of the sub-systems at the fourth and fifth levels determines whether content is revealed in terms of goal-seeking functions or in terms of jobs and occupations.

The "product design and development" sub-system was selected and presented in Figure 8 to illustrate the fifth-level content which may be identified.

The fifth-level models reveal a large volume of content important for understanding how goods are produced. Greater details of content may be derived by proceding with analysis at the sixth level, but the illustrations were concluded with the fifth-level models.

Content identified by the modeling technique fits together in a "skeleton-flesh" relationship and requires no other inventorying or classification. The resulting contextual organization of content promoted the hypothesis that "older tools useful to educators for determining instructional content can be challenged as becoming inadequate for dealing with the avalanche and variability of content and knowledge extruding from the technology." A "Committee on the Student in Higher Education", chaired by Joseph K. Kauffman (2), has examined this issue in regard to higher education and expressed the following position:

> "The Committee also rejects the 'body of knowledge' tradition of curriculum building. This, in part, is a consequence of the remarkable growth and branching of knowledge, the proliferation of facts, fields and modes of knowing that makes 'coverage of the body' a vain goal. Neither any presumed shape of the body of knowledge nor any current disciplinary categorization should be an indisputable curricular command for all students."

Content delimitation and selection. All alternative approaches to organizing instructional content face the issue of scope-and-sequence. Traditional approaches sought the fundamentals which might be ordered into a sequential building-block instructional scheme: contemporary approaches seek certain sequences of problems, behavioral changes or concepts. The "orchestrated systems approach" seeks to utilize the population-sampling technique to deal with the issue.

To offer a solution to content delimitation and selection, the question becomes that of determination of an adequate sample of experiences for gaining an understanding of how our society produces its goods and services. The systems analysis tool and thinking process affords a promising alternative for dealing with the scope-and-sequence issue. The system must be defined, and the system analysis technique can then be applied.

Within the framework of the unique responsibilities for developing societal competencies for "production and consumption of goods and services", the defined "life-cycle system" of the product should reveal the scope of concern. The system is defined and illustrated by Figure 9.

SNAP MAP of Product Life-Cycle System
(Origin-to-Consumption)

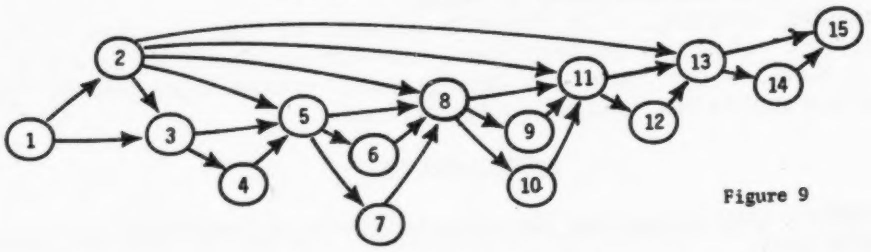


Figure 9

1. Need and demand for products (Demand for value)
2. Technical communications
3. Primary action: Extraction of raw materials (extracting value)
4. Extractive Industries: Agriculture, Forestry, Fisheries, Mining, Quarrying and Drilling
5. Secondary action: Processing Raw Materials to Stock (Adding value)
6. Stock Manufacturing Industries: Metal, wood, rubber, textiles, chemicals, plastics, ceramics, paper, leather, fur, stone, flour, etc.
7. Utility Producing Industries: Electricity, water, gas, oil, etc.
8. Finish action: Processing stock to products (adding value)
9. Consumer Products Industries: Hard goods, soft goods, chemical goods, published goods, and foods
10. Construction Industries: Homes, commercial, and public works
11. Conserving action: Servicing of manufactured products (conserving value)
12. Manufactured Product Servicing Industries: Vehicles, machine tools, power tools, appliances, buildings and structures, etc.
13. Reclaiming action: Salvaging of components and materials (Reclaiming value)
14. Salvage Industries: Parts, components, and scrap
15. Product consumed

Figure 9 exposes the full range of productive activity from raw material extraction to product consumption, and thus the alternatives are exposed for judgment and decision.

It is hypothesized that an adequate sample of involvement experiences for understandings and competencies within the unique industrial arts area of responsibilities includes consumer product manufacture of five distinct types, construction experiences of three distinct types, service and salvage experiences of five distinct types, and technical communication experiences as needed to serve each of the areas. SNAP MAP models may be developed for each specifically-defined system, and sub-system models may be developed to the level of specificity needed for instructional content.

Summary. Systems analysis and modeling techniques were applied to demonstrate an approach to industrial arts instructional content, but systems analysis is only a tool which must be applied to the correct area to produce correct results. The more important consideration was the rationale which provided direction for use of the tool.

Supporting evidence was cited for directing the tool toward the basic "human-life-system" which held that man is basically a creator, and therefore there should be more concern with his potential for creating new knowledge and content on his horizons of the future than with acquiring content by inheritance from his past horizons.

Creating, broadly defined as man's responsibility, involves a total concern for the individual and his talents, and changes the outlook of the curriculum person to include designing of the specialized environments which embody the dialectical relationships valued in society as Huebner proposed. (It is hypothesized that one area of specialized environments valued by our society is that of producing our goods and services.) The fourth-level models provide direction for design of specialized environments (viz. industry), and the fifth and sixth levels are productive of instructional content.

A significant concern is the possibility afforded by the modeling process for identification of specific content, which applies in a skeleton-flesh relationship and thereby circumvents the traditional approach involving the preparation of the content inventory and the selection from the inventory to prepare courses with logically-arranged content. The models provide a natural structure for the otherwise-nearly-unmanageable accumulation of potential content.

The systems analysis approach provides an alternative to the "building-block" approach, offering to bring instruction to the "cutting edge" of change, and it employs the sampling technique to deal with the curriculum builder's plight described by Ross Mooney as follows:

> "When the physicist found that the universe was composed of millions of entities, and all in motion, he could no longer hope to grasp the whole by focusing on the entities as such. He had to turn to systems of relationships among the entities, the realization of relationships having more substantive binding power for his thought than any substantive entity as such."

Regarding sampling, a Dr. Ripley is credited with the quotation: "The particle and the planet are subject to the same laws, and what is learned of one will be known of the other." It should be our concern to identify those systems which are the "particles" of experience that makes the "planet" (industry) known.

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The Maryland Plan and the behavioral task analysis approach

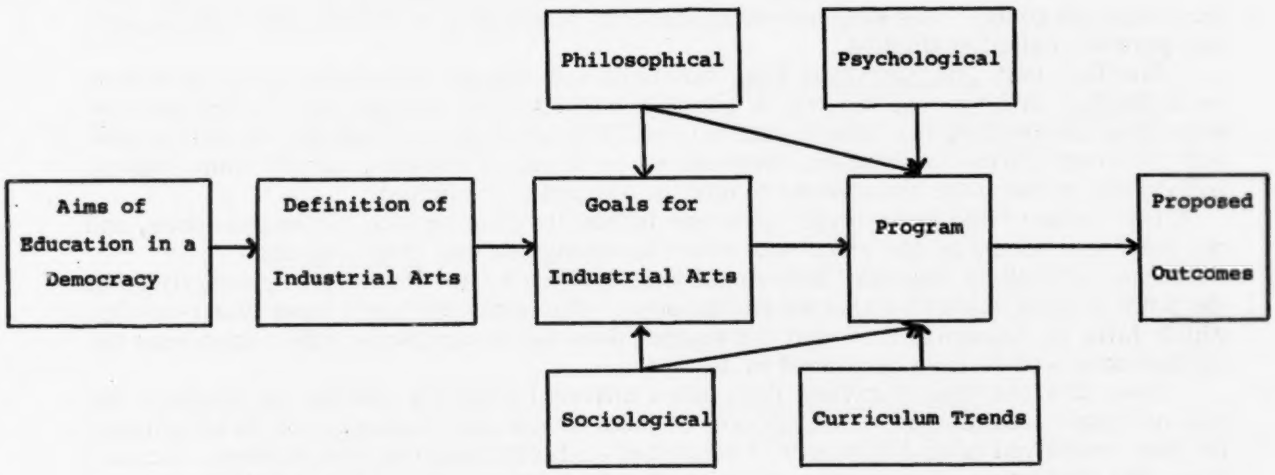
Donald A. Maley

The substance of this presentation deals with a technique for establishing a high degree of relevance between objectives, program and outcomes.

One need not belabor the obvious fact that a great deal of education suffers from a lack of relationship between goals, program and outcomes. A simple test of the validity of this statement can be made by examining the numerous courses of study that are developed annually to determine what relationship exists between the three factors (goals, program, projected outcomes).

The "behavioral analysis approach" was not the starting point for the development of The Maryland Plan for industrial arts at the junior high school level. The starting points for The Maryland Plan involved broad and highly-related areas:

The "Maryland Plan" Development Model


Philosophical
Psychological
Aims of Education in a Democracy
Definition of Industrial Arts
Goals for Industrial Arts
Program
Proposed Outcomes
Sociological
Curriculum Trends

(1) The philosophical, which included
--a concept of the function and role of education in a democracy dominated by industry and technology,
--a concept of the relationship between the school and the community,
--a concept of the importance of industrial arts in the present and future society,
--a unified and organized concept of the school itself,
--the concept of the relationship between the student and the educational enterprise, and
--the concept of man as a total organism as opposed to a disjointed matrix of independent functions.

(2) The psychological area as a starting point included
--understandings related to the nature of the student,
--theories governing man's behavior,
--the developmental tasks of the group to be served,

--concepts of learning involving such factors as motivation, individual differences, interests, involvement, aspiration, self-concept, and many more.

(3) The sociological base as another starting point included
 - --the role of man in a technological and industrial society,
 - --the responsibilities of man and his requirements for effective participation in the society,
 - --the conditions of work and living in the present and future,
 - --the impact of change and the capability of dealing with change,
 - --the concept that education has a responsibility to a total society, and
 - --the concept that education must help man in his dealing with automation, cybernetics, production, computerization, urbanization, employment, unemployment, leisure, pollution and labor-management problems, as well as with the problem of a communications gap in a society dominated by industry and technology.

(4) The curriculum trends with emphasis on
 - --student inquiry
 - --an organismic psychology
 - --a zest for learning
 - --special reinforcement
 - --teaching as a creative art with a scientific base
 - --a greater involvement and interaction of the student with the content.

The "behavioral analysis" approach does not determine whether one studies metals, plastics, organization, automation, occupations, pollution, processes or products. This is accomplished by the profession, or by definition, or through a content analysis in a curriculum study.

The Maryland Plan made use of the "behavioral analysis" process as a technique to provide a means whereby the goals and projected outcomes would have a level of precision and consistency, so that these elements would provide an endless series of clues about the kind of a program required to bring about the accomplishment of the goals and the fulfillment of projected outcomes.

Secondly, the technique was used to provide a system for describing possible outcomes that could be observed and at the same time have a one-to-one relationship with the projected goals. This step was vital, since its application dealt with that very important process called evaluation.

The fact that The Maryland Plan was built with special provisions for such factors as individual differences, inquiry, a positive self-identity, content interaction, content-individual interaction, role playing and a host of life-simulation situations, as well as new and different forms of student involvement in group processes, caused many sincere individuals to raise the question as to how the student is evaluated.

The "observable behavioral" process builds its case on what the student does, and the emphasis should be for a constant effort to strengthen that involvement.

Many educators discuss "behavioral analysis" as a one-way street or strictly from the point of view regarding what the student does. This situation has a basic short-coming which fails to recognize that what the teacher does has a significant effect upon what the student does – or is even permitted to do.

This idea led The Maryland Plan into a different kind of a role for the teacher. He was no longer looked upon as a dispenser of facts or the sole possessor of all knowledge. He was conceived of as a manager of education – a facilitator, one who inspires, encourages and evaluates. His main task is getting the best out of people and helping them to grow.

An effort will be made to discuss the behavioral task analysis as it relates to the goals, program and projected outcomes for The Maryland Plan.

The procedure by which The Maryland Plan was developed involved a four-step (or phase) process:

(1) There was an identification of goals to be attained.
(2) An analysis was made of the behaviors and experiences that related to the accomplishment of the goals.
(3) The third phase involved the development of a meaningful integration of the behaviors or experiences into a living-learning involvement with the curriculum content.
(4) The fourth phase involved an evaluation process using the behavioral analysis technique to determine the attainment of goals.

This four-step process is similar to that described in Bloom's Taxonomy of Educational Objectives in a discussion of "Educational Objectives and Curriculum Development".

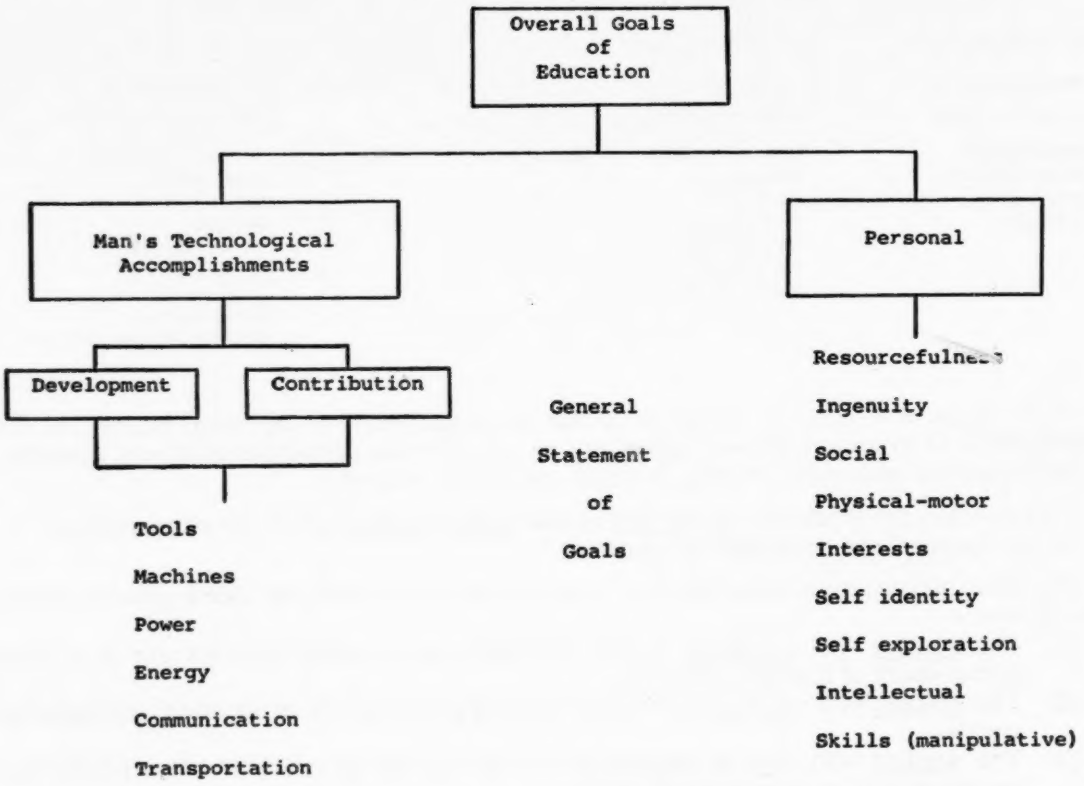
Goals or objectives. The Maryland Plan was developed after a thorough study of the overall goals of education and an examination of the relationship of industrial arts to those goals. A modified version of Gordon Wilber's definition of industrial arts was used in this instance.

The result of this examination led to the establishment of two different points of focus in setting up the general statement of goals. These two emphases were – (a) the goals that related to the interpretation and implementation of the definition, and (b) the goals that relate directly to the growth and development of the person.

Phase I

AN IDENTIFICATION OF GOALS PERTINENT TO THE AREA OF INDUSTRIAL ARTS

Grade 7 - The Anthropological Unit Approach


Overall Goals of Education
Man's Technological Accomplishments
Personal
Development
Contribution
General Statement of Goals
Tools
Machines
Power
Energy
Communication
Transportation
Resourcefulness
Ingenuity
Social
Physical-motor
Interests
Self identity
Self exploration
Intellectual
Skills (manipulative)

The behavioral analysis technique as applied to the statement of goals has the distinct advantage of re-casting the generalized forms of objectives into specific behaviors. The movement from ambiguity to a position of clarity and concreteness was an obvious result. Goals are normally stated in broad general terms that provide a base from which further clarification and delineation may be made.

As an example, The Maryland Plan might use such a general statement as --

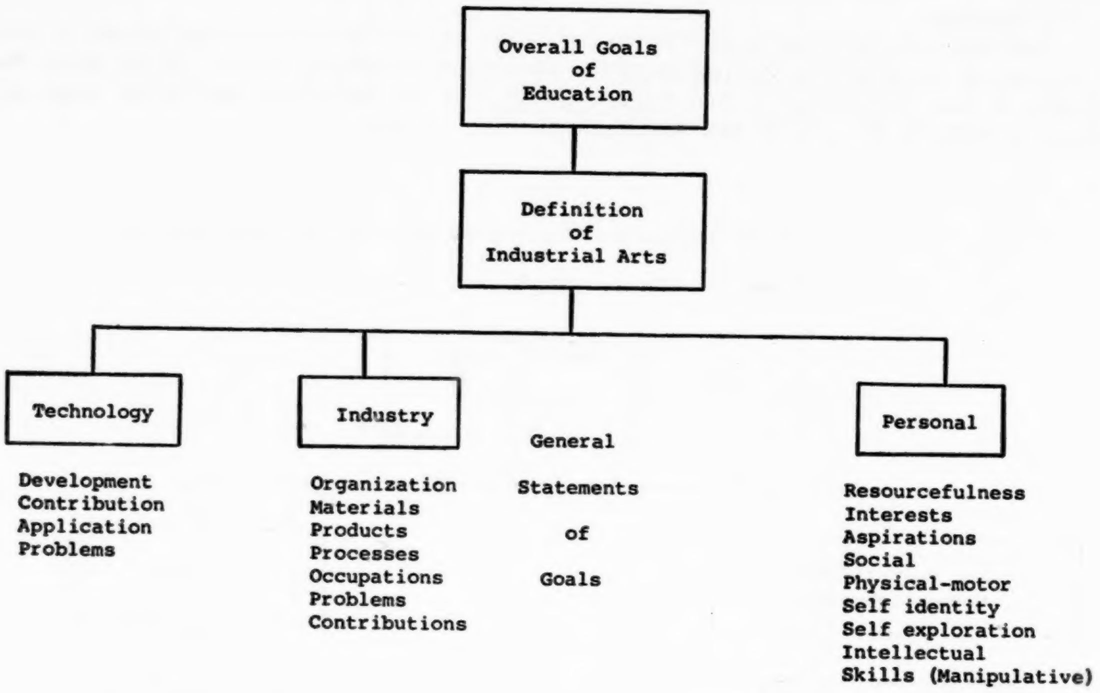
> "To develop the student's knowledge of and understanding about the organization of contemporary industry."

Such a statement would have considerable value in discussions or interpretations of the program with lay persons, school board members and administrators. Also, a series of such general objectives would serve as a base from which program developers or teachers could identify specific behaviors related to the accomplishment of the goals.

Phase II involved the analysis of the general statement of objectives to determine the behaviors or experiences that relate to the accomplishment of the goals.

Phase I

THE IDENTIFICATION OF GOALS PERTINENT TO THE AREA OF INDUSTRIAL ARTS
(Grades 8, 9)


Overall Goals of Education
Definition of Industrial Arts
Technology
Industry
General Statements of Goals
Personal
Development
Contribution
Application
Problems
Organization
Materials
Products
Processes
Occupations
Problems
Contributions
Resourcefulness
Interests
Aspirations
Social
Physical-motor
Self identity
Self exploration
Intellectual
Skills (Manipulative)

Since there are several forms or kinds of organization in industry, let us take the "organization of management personnel" as an area for the development of our example. As a general statement of goal, it might appear as follows:

"To develop the student's knowledge of and understanding about the organization of the management personnel in industry."

The goal behavioral statements that could be identified with the above general statement include --

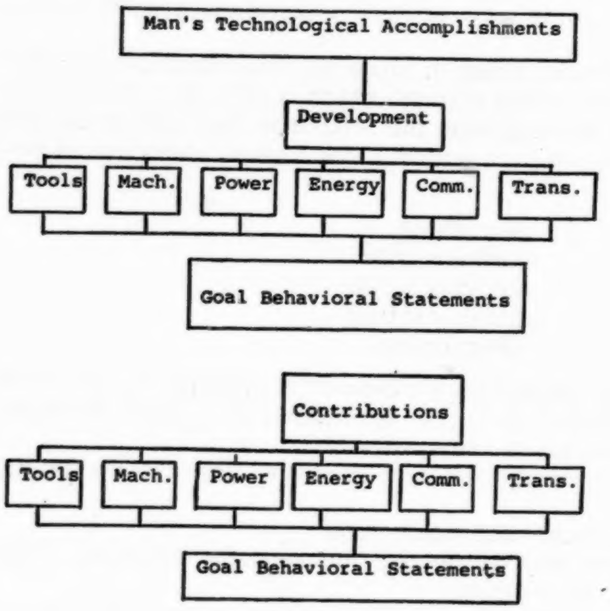
(1) The student will construct a line and staff organization chart for use in a class group study of a major industry.
(2) The student will compare different forms of personnel or production organization charts.
(3) The student will use an organization chart in the directing of a line production experience or major industry study.
(4) The student will describe the organization (personnel, financial, production, etc.) of a particular contemporary industry.
(5) The student will apply the principles of good organization in his leadership role in the class.
(6) The student will develop a photographic display of the student personnel organization.
(7) The student will carry out a management role in industry.
(8) The student will solve problems related to the management of the student company.
(9) The student will interact with others on a hierarchy of company positions from management to labor force.
(10) Etc.

It is important to note that in each case there was an action verb (solve, construct, compare, use, describe, apply) associated with the delineated statement of the objective. This was in each case an observable behavior.

A central point that must not be lost at this time is that there should be a number and variety of kinds of circumstances through which a general statement of goal could be interpreted.

Phase II

ANALYSIS OF BEHAVIORS OR EXPERIENCES THAT RELATE TO THE ACCOMPLISHMENT OF THE GOALS

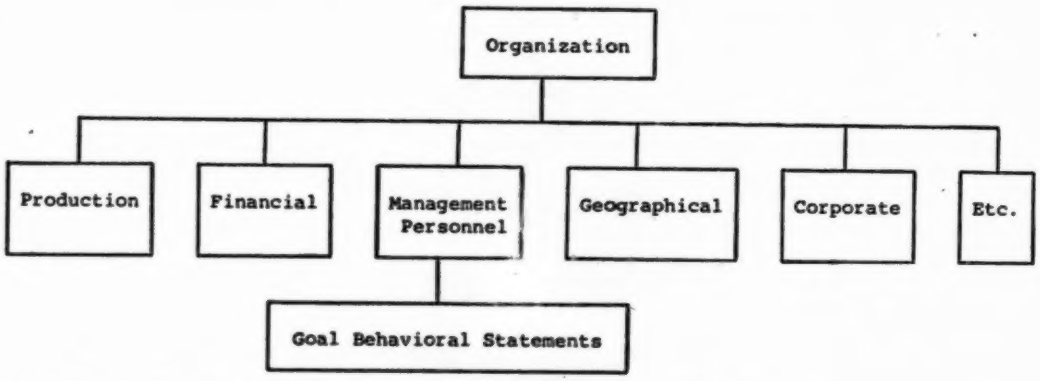

Man's Technological Accomplishments
Development
Tools
Mach.
Power
Energy
Comm.
Trans.
Goal Behavioral Statements
Contributions
Tools
Mach.
Power
Energy
Comm.
Trans.
Goal Behavioral Statements

Personal

Resourcefulness
-- Behavioral Goals
Physical - Motor
-- Behavioral Goals
Social
-- Behavioral Goals
Self identity
-- Behavioral Goals
Self exploration
-- Behavioral Goals
Intellectual
-- Behavioral Goals
Skills (Manipulative)
-- Behavioral Goals
Etc.

Phase II

ANALYSIS OF BEHAVIORS OR EXPERIENCES THAT RELATE TO THE ACCOMPLISHMENT OF THE GOALS


Organization
Production
Financial
Management Personnel
Geographical
Corporate
Etc.
Goal Behavioral Statements

1. The student will construct a line and staff organization chart for use in a class group study of a major industry.
2. The student will compare different forms of personnel or production organization charts.
3. The student will use an organization chart in the directing of a line production experience or major industry study.
4. The student will describe the organization (personnel, financial, production, etc.) of a particular contemporary industry.
5. The student will apply the principles of good organization in his leadership role in the class.
6. The student will develop a photographic display of the student personnel organization.
7. The student will carry out a management role in industry.
8. The student will solve problems related to the management of the student company.
9. The student will interact with others on a heirarchy of company positions from management to labor force.
10. Etc.

It also should be stated that there could be a series of general goals that related to the matter of organization in contemporary industry. These would center about such aspects of organization as financial, personnel, production, conglomerate, diversified, corporate, geographical, etc. Each of these could be analyzed into a series of specific behavioral goals that would provide concrete and precise statements to give a more definitive direction to the program.

The statement of behavioral goals in some areas of study has been facilitated by the identification of a specific series of action verbs through which nearly all course goals could be stated. A curriculum group working with the American Association for the Advancement of Science has listed the following ten action verbs for the statement of behavioral goals in science:

identifying
distinguishing
constructing
naming
ordering
describing
stating a rule
applying a rule
demonstrating
interpreting

The suggested procedures for The Maryland Plan for industrial arts has not provided any such list, and has left the action verb selection up to the teacher as long as the basic principles of behavioral (observable action) goals are maintained.

The establishment of any set of goals would require a series of imperatives for the program.

The achievement of goals would be directly dependent upon

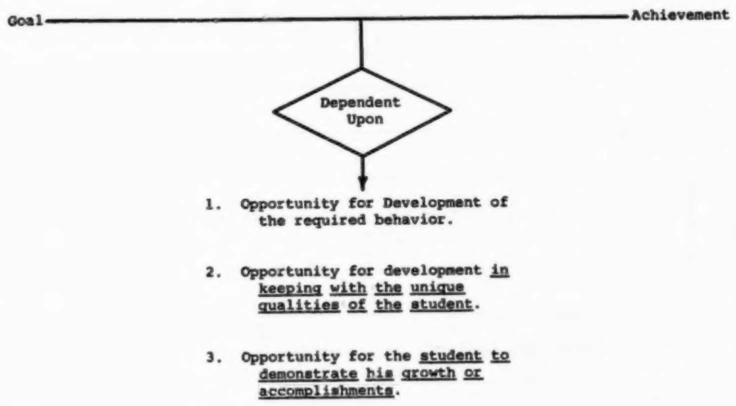
(1) The student's having the opportunity to develop the required behavior. This would involve many instances of opportunity;

(2) The student's having many opportunities for development in ways that are in keeping with the unique qualities of the student; and

(3) The student's having many opportunities to demonstrate his growth or accomplishments.

Of course, from the evaluation and guidance point of view, the teacher should and must have the opportunity to observe the student's growth or accomplishments. This is a crucial point that will be mentioned later.

Goal - Achievement and Opportunity Factors



1. Opportunity for Development of the required behavior.
2. Opportunity for development in keeping with the unique qualities of the student.
3. Opportunity for the student to demonstrate his growth or accomplishments.

Phase III in the development of The Maryland Plan is perhaps the point of greatest significance. It was at this point where the speculated and analyzed behaviors were integrated and re-cast in a living-learning involvement with the content of industrial arts.

The involvement strategies drew upon the sociological, psychological, philosophical factors as well as strong direction from recent statements of curriculum trends. The result was the following eighth- and ninth-grade program:

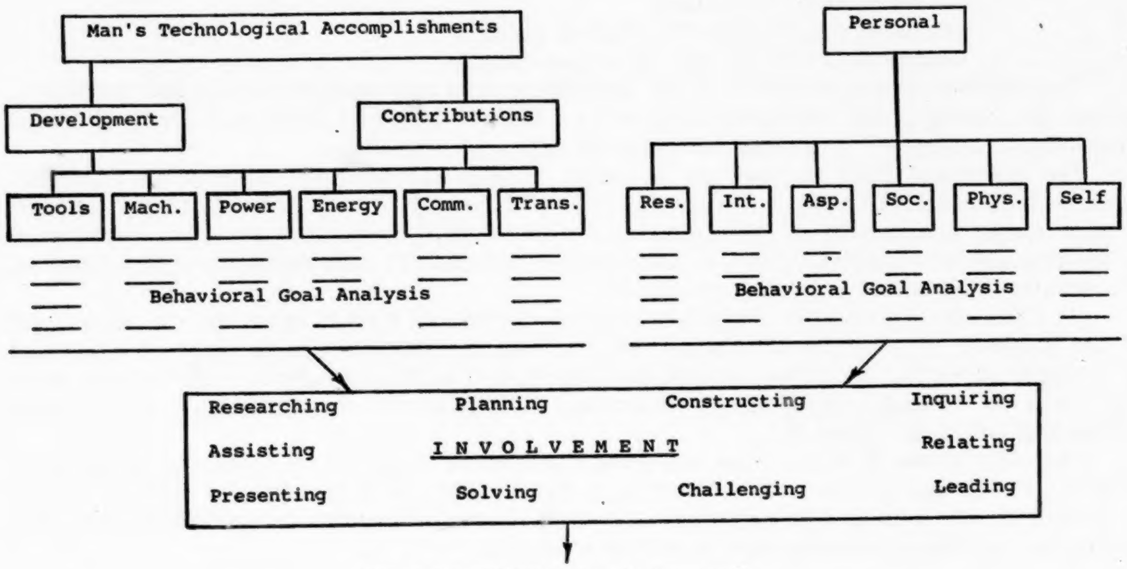
Eighth Grade:

The study of contemporary industry through a line production experience.

An in-depth study of a major basic industry using the group project approach (e.g., steel, aluminum, lumber, plastics, paper)

Phase III

THE DEVELOPMENT OF A MEANINGFUL INTEGRATION OF THE BEHAVIORS OR EXPERIENCES INTO A LIVING-LEARNING INVOLVEMENT WITH THE CURRICULUM CONTENT

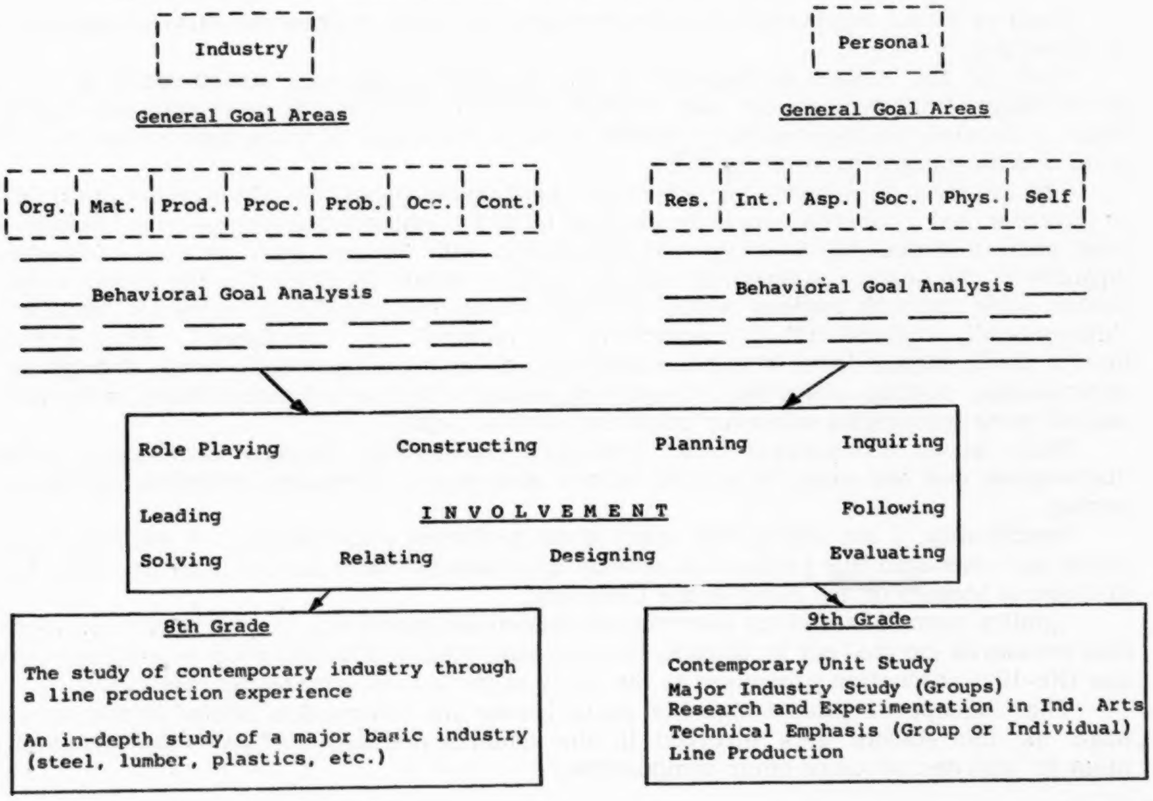

Man's Technological Accomplishments
Personal
Development
Contributions
Tools
Mach.
Power
Energy
Comm.
Trans.
Res.
Int.
Asp.
Soc.
Phys.
Self
Behavioral Goal Analysis
Behavioral Goal Analysis
Researching
Planning
Constructing
Inquiring
Assisting
INVOLVEMENT
Relating
Presenting
Solving
Challenging
Leading

The Anthropological Unit Approach

1. The Development of Tools and Machines and Their Contribution to the Growth of Civilization.
2. The Development of Power and Energy and Their Contribution to the Growth of Civilization.
3. The Development of Communications and Transportation and Their Contribution to the Growth of Civilization.

Phase III

THE DEVELOPMENT OF A MEANINGFUL INTEGRATION OF THE BEHAVIORS OR EXPERIENCES INTO A LIVING-LEARNING INVOLVEMENT WITH THE CURRICULUM CONTENT


Industry
Personal
General Goal Areas
General Goal Areas
Org.
Mat.
Prod.
Proc.
Prob.
Occ.
Cont.
Res.
Int.
Asp.
Soc.
Phys.
Self
Behavioral Goal Analysis
Behavioral Goal Analysis
Role Playing
Constructing
Planning
Inquiring
Leading
INVOLVEMENT
Following
Solving
Relating
Designing
Evaluating
8th Grade
9th Grade

8th Grade

The study of contemporary industry through a line production experience

An in-depth study of a major basic industry (steel, lumber, plastics, etc.)

9th Grade

Contemporary Unit Study
Major Industry Study (Groups)
Research and Experimentation in Ind. Arts
Technical Emphasis (Group or Individual)
Line Production

Ninth Grade:

A multiple-opportunity program involving --

- Contemporary unit studies dealing with technology
- Research and experimentation in industrial arts
- Advanced line production
- Advanced major industry studies (group)
- Technical emphasis (group or individual)

The seventh-grade program, in its anthropological unit studies of tools and machines, power and energy, and communication and transportation, was developed along the same "behavioral analysis" technique but towards different objectives.

The Maryland Plan through its separate phases has been for many years dedicated to three basic ideas in program planning. Each of these is aimed at the goal of providing a wide range and variety of opportunities for the student to become an active participant in the process of learning as well as have ample and diverse opportunities to demonstrate his accomplishment of projected outcomes.

(1) Optimum learning is dependent upon the level and kind of involvement on the part of the student. It is the student's involvement and interaction with the area of study that is a center of focus. This involvement and interaction through designed experiences takes the form of testing, challenging, selecting, interpreting, constructing, manipulating, evaluating and many more.

Recently in one of my classes where each student is required to engage in the process of problem solving as a principal activity, I asked a student to list for the class the kinds of actions or involvement he experienced in the solution of a particular problem. The following is a listing of actions indicated by the student:

trying things
inquiring
observing
evaluating
recalling
choosing
planning
applying
discarding

speculating
projecting
constructing
testing
innovating
substituting
interpreting
manipulating
concluding

generalizing

Each of these represents an act of behaving and each represents varying degrees of involvement.

Each of the phases or aspects of The Maryland Plan was structured to permit a broad range of involvement for each student in keeping with his unique talents and aspirations. Likewise the opportunity to behave in the performance of tasks appropriate to each level was an integral part of the plan.

The teaching of industrial arts through The Maryland Plan has stimulated a great deal of interest and concerns about the degree to which educational processes stimulate or even permit student involvement and interaction with the content of an area. A student engaged in the study of a physical material might consult his class lecture notes or diligently wade through endless pages of descriptions involving such terms as "tensile", "elongation", "pliability", "conductivity", "texture" or "hardness". On the other hand a much higher level of involvement could bring meaning to such words through experimenting, testing, observing, comparing, using, ordering and generalizing in the pursuit of some meaningful endeavor requiring such activities.

Many broad and general topics that have traditionally been the province of verbal discussions can and must be moved to new dimensions of student experiencing and behaving.

Specifically, I am saying that many of the problems encountered in a student-structured and -managed line production activity approach the concreteness of those in the line at General Motors or the Ford Motor Company.

Quality control leaves its abstract symbolism and enters into the operations of specified standards carried out by gauges, instruments, tests and observation as students pursue life-like production processes in the study of the volume-producing industries.

The concept of interchangeable parts leaves its abstraction behind on the printed page as the student gets involved in the quantity production of parts that eventually must fit with one or more other components.

No textbook or lecturing psychologist could transmit the meaning and impact of boredom (a major problem in industry) comparable to that which an individual might experience on a line production activity where he is required to endure a prolonged period of routine application.

The study of occupations gains new relevance and dimensions as the student gets involved in the role of a particular occupation and as he interacts with other occupational roles set up in the class.

The responsibilities and requirements of leadership take on new dimensions as one assumes such a position in a well-designed group effort in the study of industry and technology.

A point of particular interest and curiosity to me has been the involvement-attitude that seems to prevail in most of education. It is an attitude of merely needing to attend, to sit and to be lectured to, or to passively endure the reports of his classmates, or to comply with assignments and requirements. Each of these is a product of attitude-building over a period of years that stems from the lack of meaning, endless canned experiences, uninspired teachers, and programs without challenge.

Think if you will what would happen if the student from his earliest of schooling were stimulated, encouraged and rewarded for his interaction with the content and principles of each area of the school. Think what would happen if the students took up the challenge of testing, verifying, relating, applying and interpreting the principles, content and practices in every class or course. If one's education is to be more than a period of endurance or if it is a period of years for stockpiling the neatly-packaged content of an educational system without ever so much as poking your finger through the wrapper to check on its substance, surely a new era of individual educational involvement is in order.

(2) A second idea that is very much a part of The Maryland Plan is to bring life and reality into the industrial arts laboratory. This concept is directly linked to the development of behaviors and the stimulating of students to perform in meaningful and observable ways.

The circumstances may involve a class seminar, a board of directors' meeting, the purchase of materials for a line production experience, investing in stock issued by the student-organized company, conducting a sales campaign, directing a group project or carrying out the functions of a personnel director. A major process for the development of people that has had wide acceptance by industry is the activity of "role playing". The reality of educational activities is greatly strengthened by effective role playing. It becomes an effective instrument or strategy that presents the display of behaviors in leading, following, challenging, designing, constructing, communicating, interpreting, evaluating, selecting, analyzing, and many more.

Let us examine just one of many kinds of role-playing instances that stem from an attempt to bring reality and life-like activity into the industrial arts program --

The specific role example is that of a safety director on either a major industry study (group project) or a line production experience. This is a reality-centered, life-like experience in the study of occupations. Please keep in mind that every other student is involved in some other occupational role as would be appropriate in a well-structured personnel plan for either of the above activities.

The reality-centered activities are divided into two categories – primary involvement and secondary involvement. The "primary involvement" is experienced by the student playing the role of the safety director, while the secondary involvement is experienced by all of the other students in the organization as the safety director performs his role.

The chart on the following page depicts in detail the two different levels of involvement as each experiences a life-like reality-centered approach to the study of occupations.

The life-like, reality-centered activities are many and varied, but they should be an integrated part of a student-centered study.

It also is possible that such activities may involve the whole school as well as reach out into the community.

(3) The third point in this series relates to the concept of first-hand information as opposed to second- or third-hand information. It soon will be obvious that this point is directly related to the previous two points.

As an introduction to this point, the following statement from Alfred North Whitehead appears appropriate:

> ... First-hand knowledge is the ultimate basis of intellectual life. To a large extent book-learning conveys second-hand information, and as such can never rise to the importance of immediate practice. Our goal is to see the immediate

A Reality-Centered Study of Occupations
Primary and Secondary Student Involvement Aspects
(Example--The Safety Director)

Primary Involvement	Secondary Involvement
The student who performs in the role of a safety director ---	The other students who come into contact with the program and activities of the safety director ---
-- directs the safety program	-- required to perform in a safe manner
-- draws up a safety program	-- receives directions from the safety director
-- constructs safety record charts	-- may serve on a safety committee
-- designs accident report forms	-- listens to reports by the safety director
-- interprets his role to other students	-- observes the safety director in action
-- studies the literature related to safety in industry	-- participates in safety discussions, field trips, etc.
-- contacts safety directors in industry for information	
-- analyzes safety problems and hazards in the laboratory	
-- leads by chairing the safety committee	
-- designs safety or protective guards or apparel	
-- posts or displays safety bulletins	

> events of our lives as instances of our general ideas. What the learned world tends to offer is one second-hand scrap of information illustrating ideas derived from another second-hand scrap of information. The second-handedness of the learned world is the secret of its mediocrity. It is tame because it has never been scared by facts.... (1, p. 61)

The movement towards the first-hand experience demanded a new and drastically different role for the industrial arts program and the environment of the laboratory:

(a) It became a place where young people were faced with decision-making and the consequences of their conclusions.

(b) It became a place where inter-personal relationships and functioning took on life-like proportions.

(c) It became a place that put the direct actions and behavior of the individual in a primary role as opposed to the primacy of second-hand information and the memorization of the past.

(d) It was an attempt to have students behave in new and different dimensions. The old vicious cycle of:
  (1) the teacher demonstrates;
  (2) the student role was to imitate the teacher's demonstration; and
  (3) the teacher evaluates the excellence or lack of excellence in imitation;
was a prime target for elimination by The Maryland Plan.

(e) It became a place where inquiry, resourcefulness, leadership and ingenuity were tested in the context of living-learning situations.

The fourth phase in the development of The Maryland Plan was to establish some system to determine the extent to which the goals were attained. This was accomplished by applying the "behavioral analysis" technique in a common wave-length with the earlier statements of goals.

The outcomes of an educational experience should reflect the attainment of the goals that established the direction for the course or program. There must be that one-to-one relationship between the two ends of the educational process. That is, the expected product was pretty well identified when the goals were established.

The problem that arises is one of evaluation. When and how does one know when an educational objective has been accomplished or reached?

This is when the old problem of ambiguity in goals would create its usual "hang-up". If the statements of goals included such terms as insights, appreciations, understandings, familiarity with, knowledge of, etc., when one comes to evaluation the big question becomes quite obvious.

When or how does one know that the student understands – that he has a knowledge of – that he appreciates? Our miraculous ingenuity with brain-wave sensing devices and electronic systems for scanning the accomplishment files in the human brain have nothing to offer in the solution. The answer lies in *what the student does* that reflects the attainment of the objective. The only clue is overt human behavior, and that is what the teacher must *observe* as well as attempt to evaluate its *quality*.

Now let us go back to the earlier general statement of a goal --

> "To develop the student's knowledge of and understanding about the organization of contemporary industry".

The evaluation would take its clues from the delineated behavioral goals that were stated in the second phase of the process.

Did the student in the range of his activities in the class actually --
--*identify* different forms of organization,
--*interpret* a corporate organization,
--*construct* a line and staff organization chart,
--*compare* different forms of personnel or production charts,
--*use* an organization chart effectively,
--*describe* the organization of a particular industry,
--*apply* the principles of good organization,
--etc.?

Each of the above represents a potential set of clues that reflect in some measure

> --"the student's knowledge and/or understanding about the organization of contemporary industry".

Again, it must be repeated that the behavioral clues identified above represent a small number of the total possible. These were given only as examples.

Furthermore, it must be emphasized that the accomplishment of the general statement of the goal *does not* require the student to be identified with *every possible* clue as set forth for a particular goal. There *must* be a sufficient number of opportunities for each student to demonstrate his attainment of the goal, and many of these will be *in ways unique to him*.

The opportunity for the student to demonstrate these behaviors may take the form of objective tests, essay tests, class-role responsibilities, assignments, student discussions, special projects, problem situations, etc.

However, it must be emphasized that if the evaluation is to be based upon observed behavior, the student may fail because the evaluator has not been able to observe that which represented the individual's performance of the behavior related to the goal.

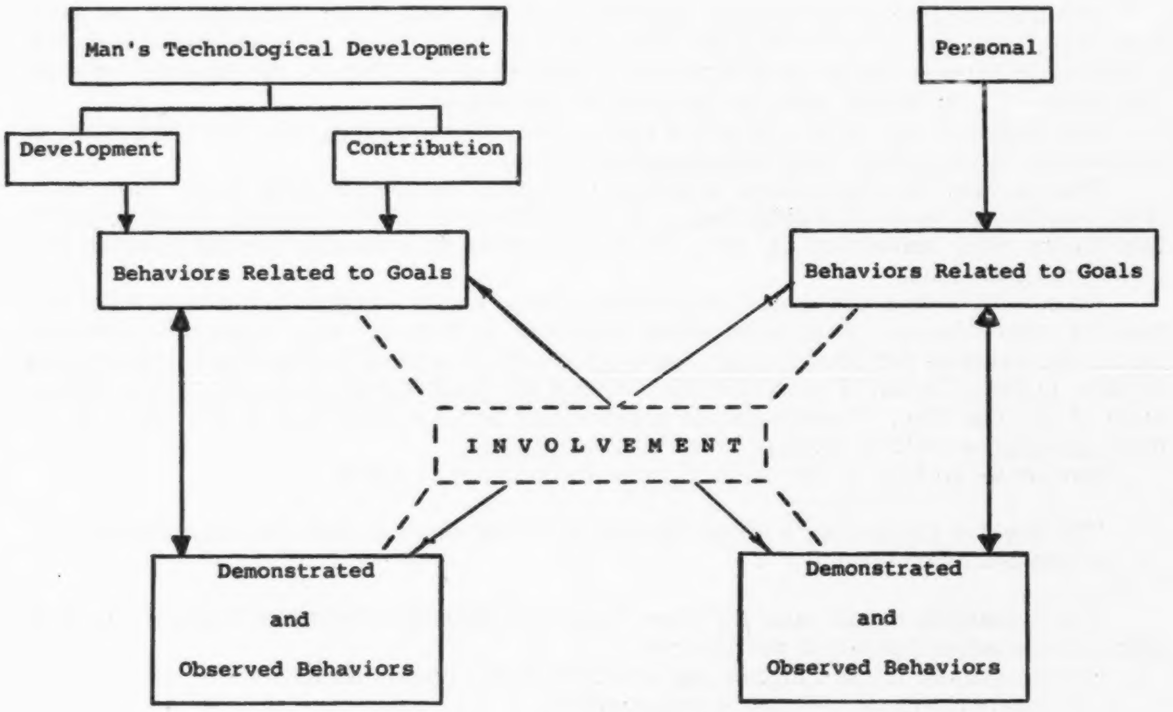
The diagram on page 105, titled "Goal-Program-Evaluation Model", is used to illustrate how the three components of goals, program and projected outcomes are tied together. The simplicity of the leadership model is only for illustrative purposes in teaching the sequence of events contributing to the consolidated behavioral task analysis approach.

In conclusion, I am requesting a form of education that puts the student in a new role. He must move into the *process of generation through involvement* in concrete and meaningful ways.

The industrial arts laboratory and the total school must move away from its preoccupation with --

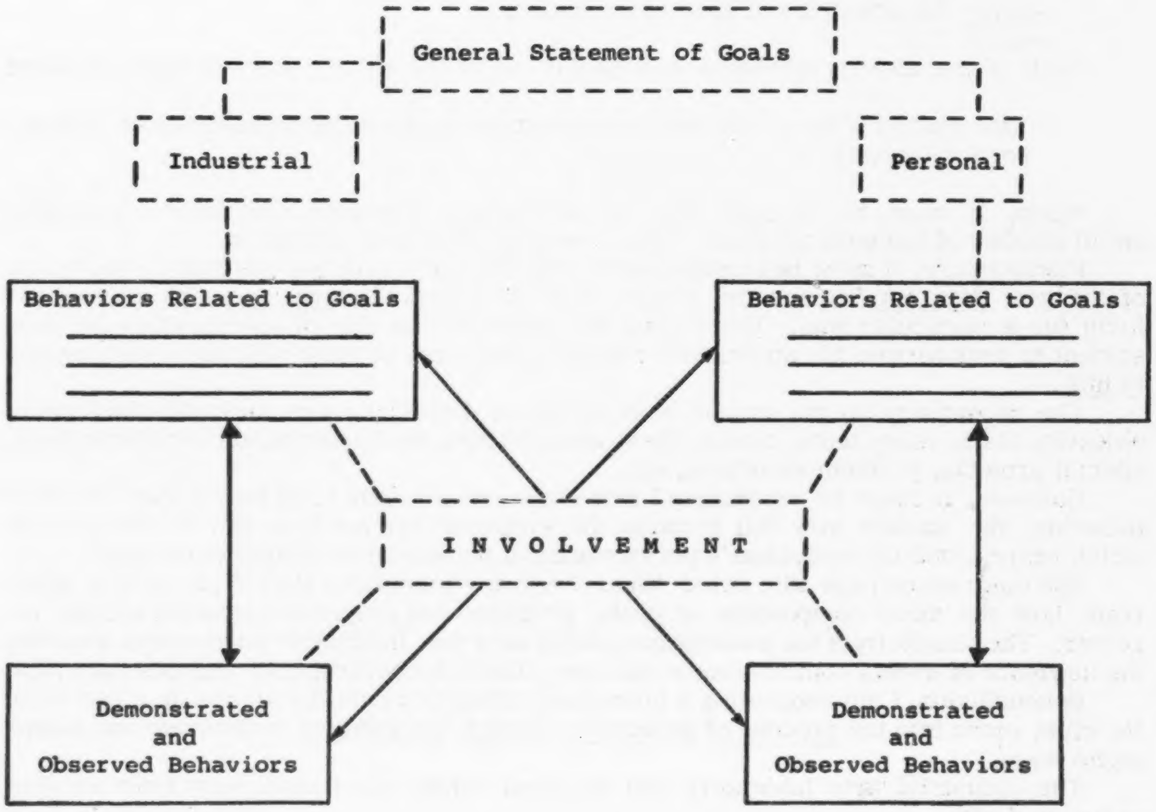
Phase IV

EVALUATION PROCESS TO DETERMINE THE ATTAINMENT OF GOALS

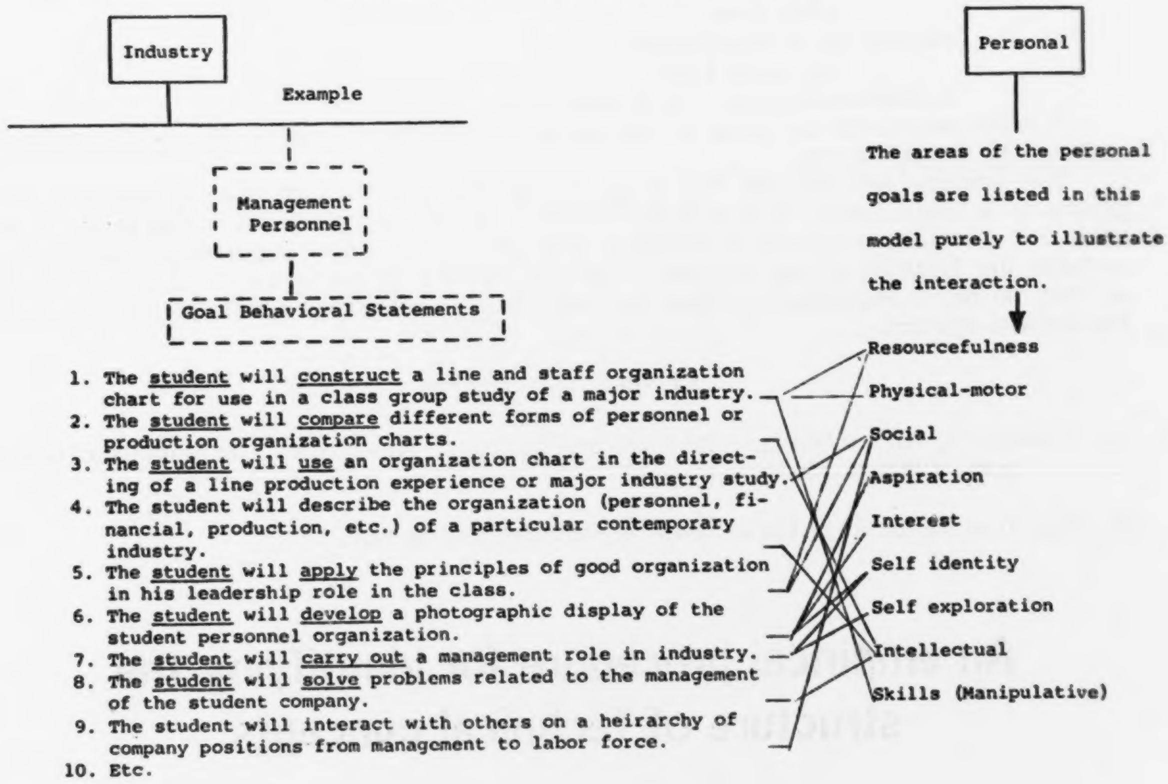

Man's Technological Development
Personal
Development
Contribution
Behaviors Related to Goals
Behaviors Related to Goals
INVOLVEMENT
Demonstrated and Observed Behaviors
Demonstrated and Observed Behaviors

Phase IV

EVALUATION PROCESS TO DETERMINE THE ATTAINMENT OF GOALS

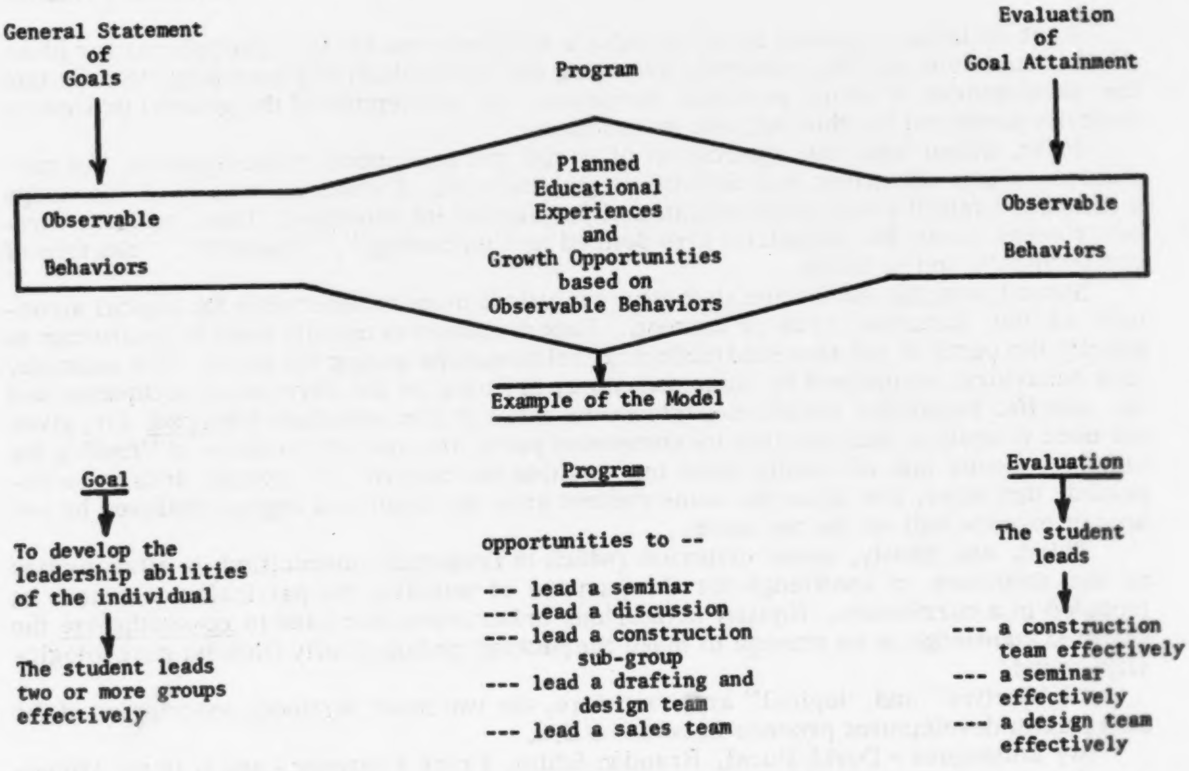

General Statement of Goals
Industrial
Personal
Behaviors Related to Goals
Behaviors Related to Goals
INVOLVEMENT
Demonstrated and Observed Behaviors
Demonstrated and Observed Behaviors

INDUSTRY - PERSONAL GOAL INTERACTION MODEL


Industry
Example
Management Personnel
Goal Behavioral Statements
Personal
The areas of the personal goals are listed in this model purely to illustrate the interaction.
Resourcefulness
Physical-motor
Social
Aspiration
Interest
Self identity
Self exploration
Intellectual
Skills (Manipulative)

1. The student will construct a line and staff organization chart for use in a class group study of a major industry.
2. The student will compare different forms of personnel or production organization charts.
3. The student will use an organization chart in the directing of a line production experience or major industry study.
4. The student will describe the organization (personnel, financial, production, etc.) of a particular contemporary industry.
5. The student will apply the principles of good organization in his leadership role in the class.
6. The student will develop a photographic display of the student personnel organization.
7. The student will carry out a management role in industry.
8. The student will solve problems related to the management of the student company.
9. The student will interact with others on a heirarchy of company positions from management to labor force.
10. Etc.

Goal - Program - Evaluation Model


General Statement of Goals
Program
Evaluation of Goal Attainment
Observable Behaviors
Planned Educational Experiences and Growth Opportunities based on Observable Behaviors
Observable Behaviors
Example of the Model
Goal
Program
Evaluation

To develop the leadership abilities of the individual

The student leads two or more groups effectively

opportunities to --
--- lead a seminar
--- lead a discussion
--- lead a construction sub-group
--- lead a drafting and design team
--- lead a sales team

The student leads
--- a construction team effectively
--- a seminar effectively
--- a design team effectively

the reading -- recitation mode,
away from
the lecture -- listen mode,
and away from
the demonstration -- imitation mode.

It must move into the arena of relevance to life itself through a concept of education as learning through living.

The inactive and passive role of the student characteristic of most educational programs is a basic factor in our ineffectiveness. It also provides a singular mode of instruction that fails to reach substantial segments of the school population. And finally, perhaps the failures of our schools might not reflect the inadequacies of human beings as they do more accurately reflect the individual's inability to handle an inappropriate educational system.

LITERATURE CITED

(1) Whitehead, Alfred North. The Aims of Education. New York: The MacMillan Company, 1952, p. 166.

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An empirical procedure for identifying the structure of technical concepts

Jerome Moss, Jr.
David J. Pucel
Brandon B. Smith
Frank C. Pratzner

What is being espoused by all of today's speakers are kinds of procedures for identifying, analyzing and then somehow selecting and re-synthesizing knowledge to facilitate the development of more powerful curricula. My perception of the general procedure typically employed for this purpose is as follows:

First, based upon the application of social and educational value systems, the curriculum-maker identifies and delimits a general area of concern or field of knowledge and makes explicit some basic educational purpose for its selection. Thus, we have various content areas for industrial arts defined as "technology", "industry", "clusters of occupations", and so forth.

Second, a highly subjective, deductive analysis is made to determine the logical structure of the identified area of content. Expert opinion is usually used in an attempt to specify the parts of the whole and the logical relationships among the parts. For example, task behaviors, recognized by some technique, are used as the parts of an occupation and the specific knowledge needed to perform the tasks is then somehow inferred. Or, given the need to analyze industry into its component parts, the analytic process of "finding the bits and pieces and of teasing them into position for best fit" is applied. It is to be expected, therefore, that given the same content area the results of logical analyses by two sets of experts will not be the same.

Third, and finally, some criterion (which is frequently unspecified) is often applied to the structure of knowledge for the purpose of selecting the particular content to be included in a curriculum. Equally mysterious criteria are then used to re-synthesize the selected knowledge in an attempt to make the package pedagogically (that is, psychologically) sound.

"Subjective" and "logical" are, therefore, the two most pertinent descriptors of the curriculum development process in common use.

My colleagues - David Pucel, Brandon Smith, Frank Pratzner - and I, in the Minnesota Research Coordination Unit for Occupational Education, have recently been developing and testing a different approach to curriculum-making. It's a procedure that can be characterized by the descriptors, "empirical" and "psychological". While the results of our work to date are very encouraging, it is hardly ready for application to industrial arts. We are hopeful that it may be within a few years.

The process begins with the same first step as the current methodology; that is, a general area of concern or field of knowledge is specified. From that point, however, the two processes are quite disparate.

Our postulated second step is to identify the individual, group or groups whose actual behavior (common or combined behavior) we wish our students to emulate. One might say that this step is a substitute for the present fad of attempting to stipulate endless numbers of performance objectives, except that instead of having to identify and enumerate objectives separately, we identify individuals who are observed to possess all or large blocks of the desired competencies. For example, if the general area of concern is specified as a given occupation, the empirical process requires that a worker or group of workers be selected who are performing in that occupation as we would like our graduates to perform. Should the area of concern be "industry", we might then be persuaded to choose Face, Flug, Ray, Lux and Towers as our model group.

These two steps – the identification of a general area of concern or field of knowledge worth teaching, and the personification of related behaviors that will be sought in students – are obviously value-laden decisions. They should always remain that way. But the subsequent steps of the process, identifying the specific knowledge to be taught within the chosen area of concern and arranging it in a pedagogically sound manner, should be made as empirical as possible.

The remainder of the process being developed is empirical. It is not at all influenced by the nature of the decisions made in the first two steps. For instance, the process will also accommodate "technology" as the area of concern if the profession desires, and anyone can pick the model group whose knowledge about technology is to be emulated.

Perhaps the best way to explain the rest of the empirical process is to illustrate its product (as far as the process has been developed to date), and then briefly explain the nature and progress of our research on the process.

Figure I is a conceptual map. It depicts the name and the functional organization of the common technical concepts actually possessed by a group of selected radio and television repairmen. The circles at the base of the structure represent relatively low-level, specific concepts; circles at higher levels represent the more inclusive concepts which contain the common meanings of the concepts beneath them. The map is the product of the empirical process which began with a hypothetical decision to teach radio-television repair and the identification of specific radio and television repairmen who epitomized the desired performance. From that point, the process was almost completely clerical and computational. The conceptual map in Figure I can now be used as a realistic guide for selecting and organizing specific curriculum content. In this respect it is equivalent to the output of the second step in the common or logical-subjective procedure, except that the empirical analysis can be replicated, and the organization of content is psychologically functional and therefore useful in arranging curriculum content in a pedagogically sound manner.

There is insufficient time to explain the rationale or details of the empirical process, but you should know that it uses the free-association technique to identify (a) the concepts possessed by selected workers, (b) the conceptual meanings (associative), and (c) the manner in which the concepts are organized. The complete data collection process consists of administering free-association instruments to the members of the selected sample. In our studies it took four hours to collect the necessary data from each sample member; all sample members can be tested simultaneously, however, by using paper and pencil instruments.

Our first two studies used the free-association technique to determine whether the process could yield (a) reliable data, (b) conceptual maps with face validity for a specific occupation, and (c) maps that are sufficiently precise to be related to quality of performance in the occupation. Two purposive samples of workers were formed by asking foremen of large radio-television customer service organizations to identify the most and the least "flexible" repairman under their immediate supervision (using a specially-prepared instrument). Information about the backgrounds of the workers in the two samples revealed that they were very similar in terms of age, length of occupational experience, and in amount, kind and recency of preparatory and in-service vocational training. Since the studies were exploratory, there was no real concern about producing complete conceptual maps that could be used for actual curricula. Consequently, very small, local samples of workers were satisfactory, and only 163 words, randomly selected from a list of 450 major technical words, were used as stimuli in the free-association instrument administered to the samples.

What did we find from the two studies?

First, the free-association technique does produce reliable data, as measured by the test-retest procedure (median correlation about .80).

Second, the conceptual map of flexible workers (that you have already seen in Figure I) is recognized by electronic experts as having functional utility, despite certain incomplete aspects of the structure due to an incomplete stimulus word list.

Third, electronic experts had great difficulty understanding the usefulness of the inflexibles' conceptual structure. (Figure II depicts the inflexibles' structure.)

Fourth, flexible and inflexible workers differ in conceptual structure. The flexible workers' is more balanced, integrated and differentiated than the inflexible workers'.

Fifth, the two groups held different meanings (associative) for 1/3 to 1/2 of the 163 major technical words used in the free-response instrument.

Sixth, the flexible workers had a much larger technical vocabulary than the inflexible workers.

Seventh, the flexible and inflexible groups use their vocabularies in different ways. Different terms assume major emphasis in the associative usage of the two groups, indicating that the groups tend to view the technical radio and television vocabulary from different perspectives.

A third study, currently under way, is replicating the first two investigations using samples of radio communication technicians. The analysis completed thus far appears to confirm almost every specific finding of the first two studies. In addition, it is beginning to look as if we can readily identify portions of conceptual structure which are common to the flexible radio-television and the flexible radio communications groups – common, that is, in terms of conceptual labels, conceptual meaning and conceptual organization. The process should therefore provide a meaningful basis for developing introductory curricula of occupational clusters which guarantee positive cognitive transfer to later-more-specialized curricula.

In summary, the studies have shown that the free-association process seems (a) capable of empirically and reliably generating a conceptual map of a given occupation which appears to have face validity for experts in that occupation, and (b) sensitive enough to differentiate between workmen performing the same tasks at different qualitative levels. In addition, it is beginning to look as though the process can be used to identify structural and conceptual commonalities among occupations.

There are, however, obvious limitations of the methodology that should be made explicit. First, the procedure does not yield a curriculum, but information from which a curriculum (or curricula) can be developed.

Second, the maps produced can only depict the conceptual structure of the model individuals whom we can presently find. We can never be certain that the structure identified is "ideal".

Third, the procedure, as it has been applied thus far, does not reveal the affective component of the conceptual structure, nor does it directly provide evidence about manipulative competencies or cognitive styles.

Fourth, the present studies have not established a causal relationship between conceptual structure and performance, although such a relationship appears logically reasonable.

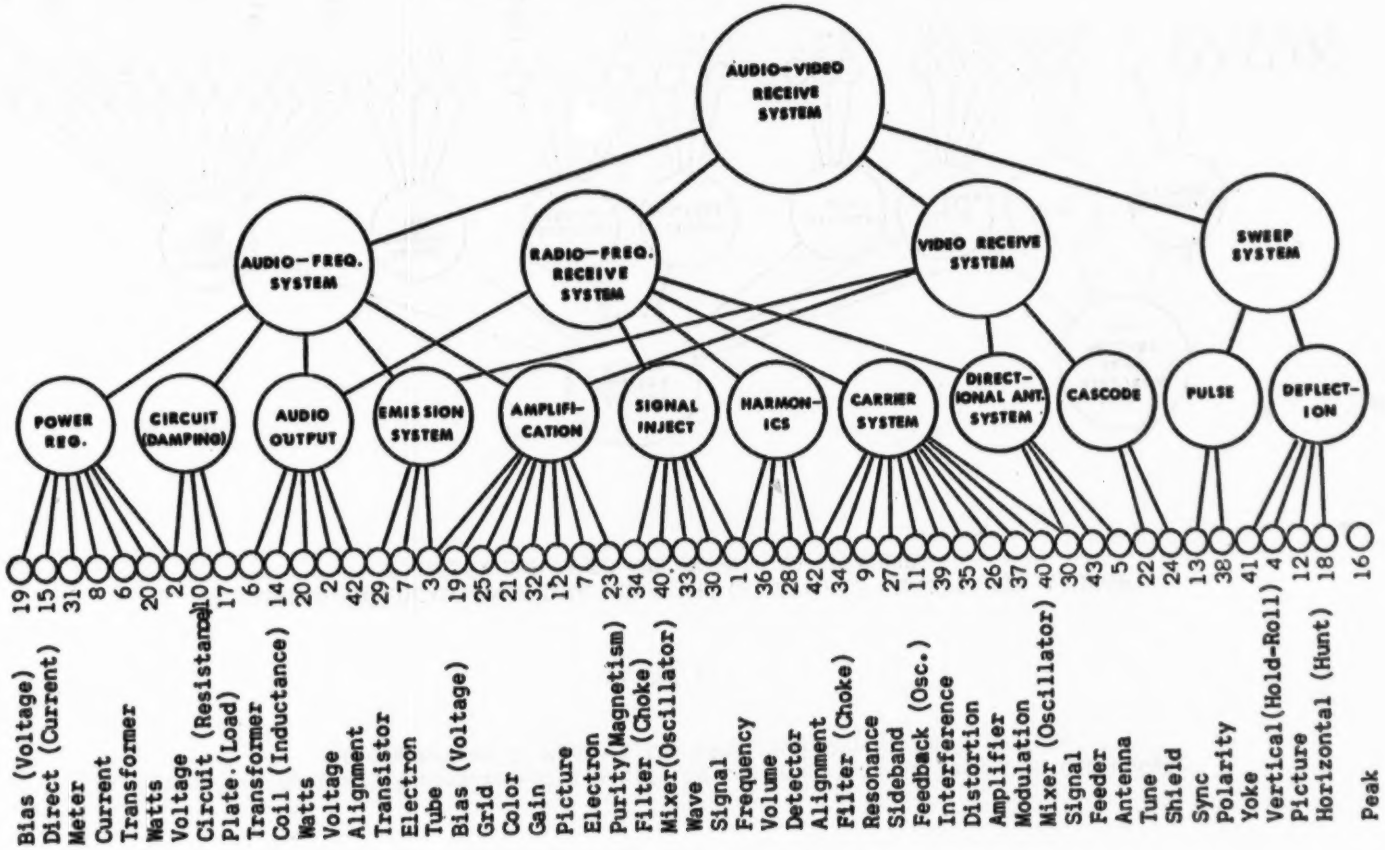
Despite these limitations, some of which are temporary, the conceptual maps produced by the free-association methodology can be employed empirically to identify technical conceptual structure. We then possess a map which represents a functional arrangement of the cognitive goals of instruction, and which provides a useful guideline for subsequent steps in the development of curricula.

Mr. Moss is on the staff of the Minnesota Research Coordination Unit for Occupational Education, University of Minnesota, Minneapolis.

(From "An Empirical Procedure for Identifying the Structure of Technical Concepts" presented by J. Moss at the 1969 AIAA Convention.)

FIGURE I

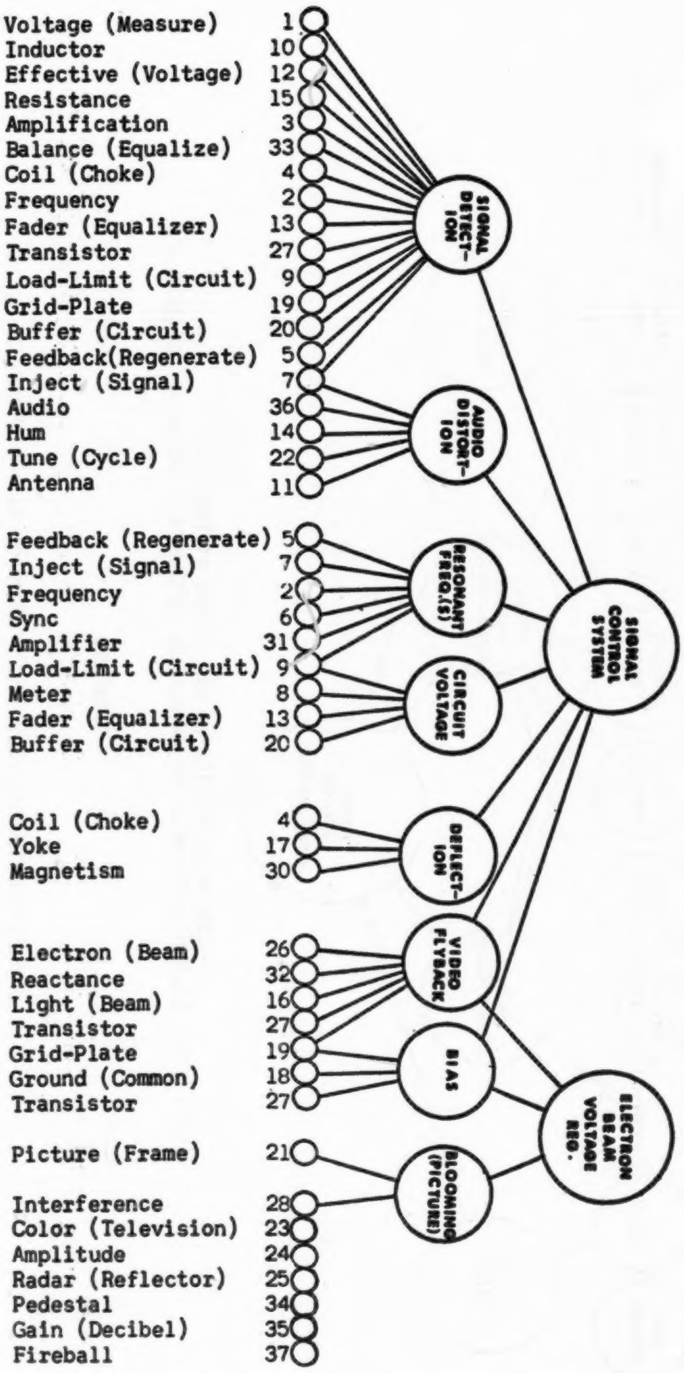
THE LABELED TECHNICAL CONCEPTUAL STRUCTURE OF STIMULUS CONCEPTS FOR A GROUP OF FLEXIBLE RADIO AND TELEVISION REPAIRMEN


AUDIO—VIDEO RECEIVE SYSTEM
AUDIO—FREQ. SYSTEM
RADIO—FREQ. RECEIVE SYSTEM
VIDEO RECEIVE SYSTEM
SWEEP SYSTEM
POWER REG.
CIRCUIT (DAMPING)
AUDIO OUTPUT
EMISSION SYSTEM
AMPLIFI-CATION
SIGNAL INJECT
HARMON-ICS
CARRIER SYSTEM
DIRECT-IONAL ANT. SYSTEM
CASCODE
PULSE
DEFLECT-ION
Bias (Voltage) 19
Direct (Current) 15
Meter 31
Current 8
Transformer 6
Watts 20
Voltage 2
Circuit (Resistance) 10
Plate (Load) 17
Transformer 6
Coil (Inductance) 14
Watts 20
Voltage 2
Alignment 42
Transistor 29
Electron 7
Tube 3
Bias (Voltage) 19
Grid 25
Color 21
Gain 32
Picture 12
Electron 7
Purity(Magnetism) 23
Filter (Choke) 34
Mixer(Oscillator) 40
Wave 33
Signal 30
Frequency 1
Volume 36
Detector 28
Alignment 42
Filter (Choke) 34
Resonance 9
Sideband 27
Feedback (Osc.) 11
Interference 39
Distortion 35
Amplifier 26
Modulation 37
Mixer (Oscillator) 40
Signal 30
Feeder 43
Antenna 5
Tune 22
Shield 24
Sync 13
Polarity 38
Yoke 41
Vertical(Hold-Roll) 4
Picture 12
Horizontal (Hunt) 18
Peak 16

(From "An Empirical Procedure for Identifying the Structure of Technical Concepts" presented by J. Moss at the 1969 AIAA Convention.)

FIGURE II

THE LABELED TECHNICAL CONCEPTUAL STRUCTURE OF STIMULUS CONCEPTS FOR A GROUP OF INFLEXIBLE RADIO AND TELEVISION REPAIRMEN


Voltage (Measure) 1
Inductor 10
Effective (Voltage) 12
Resistance 15
Amplification 3
Balance (Equalize) 33
Coil (Choke) 4
Frequency 2
Fader (Equalizer) 13
Transistor 27
Load-Limit (Circuit) 9
Grid-Plate 19
Buffer (Circuit) 20
Feedback(Regenerate) 5
Inject (Signal) 7
Audio 36
Hum 14
Tune (Cycle) 22
Antenna 11
Feedback (Regenerate) 5
Inject (Signal) 7
Frequency 2
Sync 6
Amplifier 31
Load-Limit (Circuit) 9
Meter 8
Fader (Equalizer) 13
Buffer (Circuit) 20
Coil (Choke) 4
Yoke 17
Magnetism 30
Electron (Beam) 26
Reactance 32
Light (Beam) 16
Transistor 27
Grid-Plate 19
Ground (Common) 18
Transistor 27
Picture (Frame) 21
Interference 28
Color (Television) 23
Amplitude 24
Radar (Reflector) 25
Pedestal 34
Gain (Decibel) 35
Fireball 37
SIGNAL DETECT-ION
AUDIO DISTORT-ION
RESONANT FREQ.(S)
CIRCUIT VOLTAGE
DEFLECT-ION
VIDEO FLYBACK
BIAS
BLOOMING (PICTURE)
SIGNAL CONTROL SYSTEM
ELECTRON BEAM VOLTAGE REG.

Developing a national curriculum in the technologies for the elementary grades

B. Stephen Johnson

Many programs in elementary industrial arts are and have been implemented throughout the country. Some of these programs have been excellent, and this was due primarily to the enthusiasm of a teacher, or in some cases, a supervisor, who believed strongly in an industrial arts for all students at the elementary school level. There have been and are county and state programs in elementary industrial arts which have been good-to-average and which seem to rise and fall with the tide.

How can we as educators, feeling the way we do about industrial arts being a part of every boy's and girl's program, not do something about it? Perhaps it is circumstances which have placed us in this predicament. Perhaps it is indifference to what is needed in the elementary program for boys and girls, or maybe it is the fact that we just do not know enough about learning and what the needs of boys and girls are at this level. It certainly is evident that many of the changes which have occurred in education – individualized instruction, team teaching, educational technology, new and better methods of teaching reading, etc. – have not noticeably improved the achievement level of students.

In the last few weeks I have had occasion to serve as a consultant on middle schools, and the school administration indicated that first priority in the expenditure of money would be given to the academic program and reading, and what was left over would be given to the unified arts program. Several weeks ago, I placed in the budget money to provide a travel lab for elementary industrial arts. As my prime responsibility is for secondary education, the money for this lab would be provided through the elementary education budget. The director indicated that this would not be a priority item, since reading and other academic subjects must come first. Of course, my reaction to this was that we have been putting this emphasis for so many years on reading and English, but still the child has not improved to any great extent in his ability to read, comprehend or communicate. Broward County already has several air-conditioned reading semi-trucks and special reading centers. As you can perhaps realize, this is due to panic created by national test standards which seem to dominate and determine the child's and the school's shortcomings. These tests are perhaps necessary; however, they are rather narrow in scope and are not commensurate with the vocabulary that the child sees and uses today in our technological society. To provide and complete the curriculum which should be offered to all boys and girls, we must provide, in our elementary schools, technology as part of their everyday program.

In Broward County we have for a number of years been encouraging experimentation and innovation with curriculum as well as facilities. Although many schools and teachers, particularly in the industrial arts, have been involved, the school which has received acclaim has been the Nova complex. Curriculum is presently being written in the county involving most of the 105 industrial arts teachers in the county on Individualizing Instruction in the Industrial Arts Program K-12. All industrial arts teachers are writing performance objectives and correlating tests, reading assignments and activity assignments. The eventual results will be a complete flexible curriculum K-12 program with a major portion of the students' instructional material being in the form of Learning Activity Packages and Correlated Media (audio and visual materials).

This is truly an exciting adventure for the teacher participants. This in-service program and many others for industrial arts teachers are being provided in all areas of industrial arts. Because of the rapid changes which are occurring in our technology, we cannot presently count on our universities for programs which we feel will meet our needs. Through these in-service courses, the school board provides incentive credit for participation which can apply to additional pay for the teachers. This can vary from $180. to $1,000. depending on the salary index of the teacher. The county, under a state plan, is also able to apply these credits for extension of teachers' certificates.

Presently, in Broward County, we are on the threshold of an outstanding educational system. The citizens have passed a bond issue of $108.6 million for new construction and renovation. What this will mean with state money for construction will be $147 million. Presently, 22 new schools are under construction, and many educational innovations will

be introduced into the system this fall. When the multi-million dollar construction program is finished, we will have 150 schools, lower, middle and upper level, plus additional specialized schools for exceptional and vocational training. Presently under construction are five new middle schools, grades 6, 7 and 8, which will be ready for fall, with 30 middle schools in operation in the next five years.

The elementary industrial arts program will be in need of 100 industrial arts teachers or elementary industrial arts specialists. We are operating on faith by planning for these 100 openings.

We as teacher educators and supervisors must make every effort to provide industrial arts teaching specialists for these programs!

Through our instructional television station in Broward County, we are able to show various occupations and the story of technology which is a part of our community in our elementary school classrooms. Last week I was able to make tapes for an in-service training program for reading teachers. The program was entitled Teaching Reading Through Industrial Arts.

In summation, efforts are being made throughout the country to provide elementary industrial arts programs. If we as educators believe in the program, we should make every effort to develop programs from the national level. I believe through the efforts of the ACESIA, ACIATE and ACIAS, we can bring into focus for educators of all disciplines and all levels, local, state and national, the need for industrial arts in the elementary curriculum.

I believe we must involve ourselves with the other disciplines and make industrial arts a part of the total curriculum. Many times we are so involved with our own programs that we ignore the other areas. There is just a chance that through the involvement with other disciplines we might very well provide a program which will come closer to meeting the needs of boys and girls.

In closing, I would like to make the following recommendations:

We should

(1) Establish on the national level a curriculum study committee to develop a kindergarten through 12th grade industrial arts curriculum. This should involve persons from other disciplines and other national organizations.

(2) Establish a plan for the writing of an elementary industrial arts program. This should be an effort of the local, state and national associations.

(3) Establish elementary industrial arts teacher preparation programs in colleges and universities where industrial arts has a major program.

(4) Through state departments of education and universities establish a minimum number of hours in industrial arts for all elementary majors.

(5) Provide in-service training programs in industrial arts locally and nationally for elementary teachers.

(6) Provide college retraining programs in industrial arts for the disciplines which have an overabundance of teachers, i.e., social studies, physical education, etc. These teachers, in many cases, could be retrained to teach the industrial arts subjects.

(7) In the development of curriculum, consideration should be given to a continuum, kindergarten through 12th grade, individualized and written in behavioral terms.

(8) Develop research tools to evaluate the elementary industrial arts curriculum.

And finally, the words of Browning, "Ah, but a man's reach should exceed his grasp or what's a heaven for?"

Mr. Johnson teaches in the Ft. Lauderdale (Florida) Schools.

Curricular implications of rocketry for a program in aerospace education

Ernest G. Berger

The scientific achievements and technological developments of our age have increased man's ability to transform his total environment completely and, by so doing, to attain the highest standard of living the world has ever known.

In addition to this high standard of living, our age has also been characterized as a period of unprecedented change. Some of the powerful and dynamic forces which have been most instrumental in accelerating this rate of change have been the development of new technology to support man in his space environment.

Since the dawn of the space age (1958), we have experienced an increasing concern for the development of our human resources to their highest potential. There was an immediate need for individuals who possessed high standards, who could develop articulate skills and who could work within the requirements imposed by strict quality-control techniques. Multitudes of new job classifications opened up that were heretofore unknown. The concept of zero defects became paramount. The success of a mission and the lives of astronauts depend to a large measure on the efficiency and craftsmanship of each person in the performance of his assigned task.

In the effort to increase man's knowledge of the heavens and the earth through the use of manned and unmanned spacecraft, America's space program developed new tools, new materials and new processes unheard of only eleven short years ago. It has provided great impetus to accelerating advancements and developments in science and technology and the resulting changes in our very patterns of living and learning.

It is generally agreed that the rapid advances in aerospace science and rocketry have posed serious problems at all levels of education. Most of our traditional industrial arts programs (and other disciplines as well), appear to be inadequate to cope with the technical changes that are taking place daily. By the time the children of today's "space age" assume their role in adult society, they will probably be entering an entirely new era and must be educated to cope with it. How, then, should we educate the learners of today for living in the world of tomorrow? Where might we search for a new and rich source of materials, concepts, processes and methodology to use as an improvement vehicle for industrial arts? Perhaps the aerospace industries might provide some of these answers for us.

If space is acknowledged as the new frontier of industrial technology, and if industrial arts is to give its learners an insight into this new frontier, then our teachers must be more concerned with its underlying techniques. The spacecraft is really an extension of manned aircraft, only going higher, faster and farther. It represents the transition from jets to rockets, from atmospheric flight to the vacuum of space, and from supersonic speeds to speeds associated with the orbital and escape velocities. It ushers in all sorts of interesting problems – principally the one of weightlessness.

Perhaps the most overlooked fact to the everyday observer is the scope of the aerospace industry. This industry is made up of hundreds of smaller private industries which have combined their individual talents and efforts to make the necessary software and hardware for our adventures in space. They are almost limitless in their scope and are involved in everything that flies in the air, that orbits the earth, and that probes the far reaches of outer space. They are even indirectly concerned with undersea research and technology.

Since industrial arts has the happy responsibility of defining the role of industry and technology in our society, and since the aerospace industry represents a major portion of that industry, then we might wish to consider the aerospace industry in terms of the major areas of industrial arts.

Traditionally, industrial arts is divided into eight major categories: (1) design and drafting, (2) graphic arts, (3) plastics, (4) ceramics, (5) wood, (6) power, (7) metals and (8) electricity-electronics.

(1) Design and drafting for space vehicles requires specially-designed tools for the repair or assembly operations on vehicles during space flight. When energy is applied to components of a weightless space vehicle, such as turning a bolt with a wrench, the vehicle

itself will react by turning if sufficient pressure is required for the operation. This problem could be experimented with, in our own environment, by trying to drill a hole in a tennis ball, while it is floating in a pail of water. The accidental slippage of a tool could result in serious problems, especially if it is dropped from the user's hand. Also consider the problem of collecting the chips. One might conclude that this is a special set of interesting design problems associated with the space program.

(2) In the area of graphic arts, photography has become an essential tool in the development, launching and testing of spacecraft.

The unusual demand placed on space photography necessitates the use of every conceivable type of lens, equipment and locations. Cameras mounted on the space vehicle and on the launch gantry are used to record every phase of the launch operation. Some are trained on mechanical devices, some on instruments and gauges, and some on the astronauts.

Markings and special grid patterns are painted on the missile so that engineers studying the photographs of the missile during launch and flight can detect even the slightest deviation from the predicted results. Motion pictures of the launch are taken at many different speeds ranging from 4 frames per second to 2,000 frames per second and substantially help space engineers to locate malfunctions.

In many instances the needed picture requires that the camera be mounted in an area of intense heat. Cameras mounted in the flame areas are shielded from the heat and force by being housed in steel boxes with quartz liners to protect the lenses.

When cameras are mounted on those stages of the vehicle to be jettisoned, they are equipped with separation devices and special flotation devices.

Camera equipment on unmanned satellites converts TV pictures into electrical signals to be transmitted to earth where they are reconstructed and enhanced by computers.

It might well be concluded that graphic arts plays a very important role in the space industry.

(3) Plastics: The material used in the heat shield for the Apollo Command Module must withstand temperatures in deep space of a negative 200 degrees Fahrenheit, and then survive the intense heat of re-entry of 5,000 degrees Fahrenheit.

The material developed for this job is a phenolic epoxy resin – a plastic substance. In addition to this plastic, the resin is held in place on the surface of the command module by a honeycomb matrix of fiberglass – a combination plastic-ceramic material. Without the heat shield it would not be possible to return to the atmosphere from a space voyage. Thus, it can be seen how important plastics are in aerospace technology.

(4) Ceramics are especially adaptable to high-temperature service under conditions requiring structural stability and resistance to environmental attack.

From the time that the astronauts made their first orbital flights in 1961, ceramics have had an impact on space vehicle design. Without the ceramic potential of withstanding intense heat and cold, early experiments with rocket flight probably would not have been possible.

With the development of the ablative heat shield, ceramics really reached the apex in performance. The quartz ablation shield used on the nose cone of the ICBM behaves in much the same manner as the epoxy-filled fiberglass honeycomb ablation shield of the Apollo Command Module. In both instances the materials were especially selected because of their unique ability to withstand the intense heat of re-entry.

Perhaps one of the most rapidly-developing areas of potential use for ceramics is the matrix for high-strength boran fibers.

The advantage of fiber-strengthening is that the fibers carry most of the load, while the matrix and the bonding material merely transfer the tensile stress from fiber to fiber. The best fiber form is the whisker. The whiskers are very fine, single crystals of materials which have high strength and high elastic modulus.

(5) Wood: It is interesting to note that not one piece of wood will go into space, with the possible exception of a wood handle on a geological specimen pick or a balsa cover on instruments.

Judging from the preponderance of other materials being utilized, it would seem that woodworking was being phased out completely. However, on close investigation it is discovered that woodworking is still a "mainstay" of the space industry.

To prepare astronauts for the lunar journey, NASA has constructed a number of space flight simulators of wood. In these space flight simulators, the design ideas, skills, and the "human engineering" aspects of space travel are investigated by the scientists, engineers and other technologists.

Without such wooden simulators and models of spacecraft, the progress of research and development would be greatly hampered. It would seem that woods, used in a different way, may be around for a long time to come.

(6) Power; Basically there are three systems of rocket propulsion: (a) chemical, (b) nuclear and (c) electrical.

In the liquid fuel rockets, cryogenic fuels are used. These extremely cold liquids are used to cool the nozzle of the thrust chamber. The nozzle is actually a honeycomb of tubes and fins, much like a water-cooled radiator of an automobile.

Because rockets must have a self-contained fuel supply in order to function in space, the fuel and oxidizing agent are stored in separate tanks and mixed under pressure. The space industry is faced with the same problems of clean air-fuel mixture of the proper proportions as the automobile designer, plus the additional problem of providing a combustible agent outside the earth's atmosphere at a greatly increased combustion rate.

High-voltage power sources often employ backup or dual circuitry to assure constant and reliable voltage with little variation.

Converters, inverters, transducers, sensors, and many other controlling or regulating devices are employed on both electrical and mechanical components. Almost all operate from the standard 24-28-volt aircraft-type DC system supplied from solar or fuel cells.

Silver, zinc and nickel cadmium cells are also extensively used for powering in the spacecraft.

(7) Metals: The spacecraft structure and load dynamics embrace a materials spectrum which ranges from stainless steel and the iron-base super alloys to magnesium, aluminum, titanium, beryllium and all the varieties of advanced high-temperature nickel and cobalt-base super alloys.

Eighty-five percent of the Apollo cabin section, which includes equipment, bay doors and hatches, is made of welded titanium assemblies.

One could conclude that the newer metals play an extremely important part in the space program.

(8) Electronics: The area of electricity and electronics as applied to aerospace technology is almost limitless in its scope. Sound, radio, light and almost any other form of waveform propagation are necessary to space travel.

Computers and associated controlling mechanisms or indicators are essential to the maneuverability of the spacecraft.

At least 90 percent of all components used are of solid-state type, with a concerted effort being made toward micro-miniaturization.

The space program could not function without the use of these electronic and electrical systems.

One might conclude that rocketry rides on the materials of aerospace technology and any good program in industrial arts would want to include some of this technical spin-off in order to take full advantage of the vast amount of technical data available to industrial arts educators.

It would also seem evident that the aerospace industries make a significant contribution to industrial arts, since they also are concerned with the same broad areas as industrial arts.

As an example, a hypothetical industrial arts course might well include a study of the theory of trajectory, orbital paths and the inertial guidance systems which provide information about the actual path of the space vehicle in relation to a predetermined track. The students would learn how the system stores and retrieves the preset flight instructions and how it automatically compensates for any changes in direction by computing time, distance and the various forces reacting on the spacecraft. They would learn that any differences are transmitted to the vehicle's control system without seeking additional data from outside the spacecraft.

Through laboratory experiences they would learn that the accelerometers must be kept at right angles to the force of gravity at all times because they cannot distinguish between vehicular and gravity accelerations. They would develop single accelerometers and gyros (using toy types) and actually build a stabilized platform in the laboratory.

In the area of control systems our course might cover both ground and space-borne electronic systems to include computers, the minitrack system, telemetry circuits and equipment (STADAN), and the spacecraft's command and control communications system (NASCOM). In the laboratory they might plan a space mission by developing a flight plan, designing the abort modes, and planning the alternate missions. They would also establish locations for the manned space flight network (SCAMA). In the practicum they would build and test simple retrometers (lightbeam modulators), and working models of communication satellites and other space-supportive equipment.

In the structural load system the students would study the newer space materials, their molecular properties and testing, and how these properties can be changed for new purposes.

They would study the problems involved in the staging and clustering of rockets, the design considerations behind the ballistic re-entry problem, radiation and meteoroidic particle protection devices, temperature controls and the necessary hardware for the life support systems.

Laboratory activity would include the study of various specimens of the newer al[illegible]s and their physical, chemical and electrical properties so as to determine how well these newer materials would actually perform in an hostile environment. They would use the polaroscope to study the structural integrity of the various structural systems. Actual modeling and junior engineering type of laboratory experiences would play an important part here.

A detailed study of the propulsion system would round out the course. The students would study the physical principles of propulsion to include chemical, electric and nuclear systems. They would study the fuels, oxiders and ionic power generation techniques. They would learn about the occupational aspects of engineering technicians and the skilled help that supports the aerospace industry.

In the laboratory they would relate the thrust-to-weight formula to actual laboratory experiences with miniature rockets. They would build models of solar sails, bio-chemical fuel cells, and assemble a simple cesium pinwheel periphery.

The instructional methodology for our hypothetical course might take the form of research and development techniques, sketchstorming and brainstorming, and competitive learning activities.

The lag between technological and instructional innovations and the human ability (and tendency) to deal with them constructively still appears to be one of our major problems. If our future programs would add the basic elements of rocketry and introduce the other technologies, our teaching field might soon begin to assume a central position in the profession of education – instead of remaining on the periphery.

Mr. Berger is an assistant professor in the Industrial Arts Department, Florida State University, Tallahassee.

Action in the middle school

Donald F. Smith

I would like to preface the discussion of the Orange Middle School program by clarifying one point. You will not be seeing a unified arts program. We believe at Orange that the middle school should be transitional in nature between the opposing types of organization of the elementary school and the high school. We believe that the middle school should be child-centered. But, we also believe that it should be child-centered within courses which have a body of knowledge or a basic set of concepts which must be imparted to all students. We believe that each student must have the pleasant experience of being successful. In regard to the special subjects, we believe that there are certain basic concepts and appreciations in art, in music, in home arts and in industrial arts to which all students should be exposed.

I would like to relate what my superintendent told me when he interviewed me for the position. He said that he did not see how the unified arts approach could function smoothly year after year with the turnover in personnel, etc. He further stated that he believed that art, music, industrial arts and home arts as individual courses have something to contribute to the growth and development of the early-adolescent. I agree with him one hundred percent.

He, however, made it clear that in his observation of junior high industrial arts programs he had never seen anything that impressed him as a good general education study of industry. His so-called job description for me was very simple. He had no idea what form industrial arts should take in the middle school, but he simply demanded that "Orange Middle School have the best industrial arts program in the country for the early-adolescent".

I want to make it quite clear at this point that I am not proposing that I have the best industrial arts program in the country, but I am only relating to you the so-called launching pad he used to get me into the orbit where I am today. I have no scientific evidence that it is the right orbit – only that as a total program it varies from the traditional and it has been extremely well received by the students, their parents and the administration. We are currently completing the thirteenth consecutive offering of the program in the past four years.

I have accepted Wilber's definition, "the study of industry – its organization, materials, occupations, processes and products", as an adequate one. The Orange program attempts to do something with each part of this definition.

Factors which I believe are important enough to influence the program are that it must truly be general education; it must be exciting; it must involve creative thinking; it must recognize and allow for individual differences; and it must teach as much as possible about the practical use of tools, machines, materials and ideas.

The program involves seventh- and eighth-grade boys five days per week for one semester. The seventh-graders are introduced to the program in a three-week orientation session in which they learn basic drawing techniques and the use of hand tools and most machines.

The first course, Historical Studies, is patterned after the anthropological unit program as advocated by Dr. Donald Maley of the University of Maryland. The purpose of this course is to teach students to become proficient with tools and machines in a meaningful and educational activity. Each student chooses a topic from our technological history, researches it, writes a term paper, builds a model and gives an oral report on his findings. The topic is chosen from the broad categories of tools and machines, communication, power, transportation and construction. The written reports must follow proper term paper form, with a cover, title page, table of contents, body and bibliography. The reports vary from two to twenty pages, depending upon the available reference materials and the abilities of the students. The course takes approximately ten weeks.

The second part of the seventh-grade program, Materials and Processes, is a study of the five major material industries. The text, Understanding America's Industries, is used to study the woods, metals, plastics, ceramics and graphic arts industries. Many films and filmstrips are used to supplement the text. Most of this classroom work is done when the lab is occupied by the mass production lines.

Understanding the concept of mass production no longer has to be defended as an important part of a study of industry.

The Mass Production course is introduced in the eighth grade with a study of the origin of interchangeability of parts, automatic conveyance of work, elimination of waste motion and the division of labor. Each class must then design a product, tool up, manufacture, package and market one hundred of the items on a break-even basis.

The first problem of product selection is handled by the students after the instructor has suggested the elimination of a few from a student-compiled list of about sixty items. The final design is also selected by the class from designs submitted by small groups. A company name is then selected by the class, after which each student chooses the department he will work in during the lead time. These include management, design engineering, tool design, quality control, safety, marketing, maintenance and packaging. At the conclusion of the lead time, about ten weeks, management and quality control retain their positions while all other class members are assigned to a production line job. The lab is then arranged to suit the company, and one hundred products are manufactured.

The second part of the eighth-grade program, Industrial Design, is a study of the designer-inventor role in industry. The United States patent system is studied, along with selected inventors and their contributions. The lab work is individual or small group with the projects having to fit into one of the following categories: prototype, scale model, experiment or mass production.

In the Orange Middle School program, a sincere attempt is made to study industry – its organization, materials, processes, occupations and products. The students learn immediately to use tools and machines which they are then able to utilize in the solution of problems they encounter in the subsequent courses. They do an in-depth study of an aspect of our technological history and present it to their class. They learn about the materials and processes of five industries. They are part of a major mass production problem to gain a true understanding of its complexity. Finally, each becomes an inventor and faces the problems, excitement and rewards which accompany the inventing of an article.

This semester will conclude the thirteenth offering of these courses in the Orange Middle School. I have been extremely pleased with the acceptance of this program by the students, parents and the administration.

Mr. Smith teaches at the Orange Middle School, Cleveland, Ohio.

New actions for the high school

E. Allen Bame

This year's theme of "Where the Action is" is very appropriate for the emerging industrial arts program at Warrensville Heights High School. Action, as evidenced by a high level of student activity, is certainly present.

This action is now centered around a new $650,000 facility which was occupied in January of this year (1969). In an attempt to explain the activity that is taking place here, let us take a tour of the new facility and see some of the students at work.

Our first stop is the visual communications lab. Here students are working with offset printing. They take an idea from conception through composing, layout, photography, plate making, printing and finishing.

Photography as a field of work separate from offset printing is also included in the student activity in this area. Three photolabs are a part of the visual communications lab, with one containing a horizontal process camera and used exclusively to photograph materials for offset plate making.

The second photolab is designed for use as a film room with two small loading rooms adjacent to it. The third photolab is used for print work, with several enlargers, a print dryer, and developing sink making up the equipment.

The second area on our tour is the power lab. The name "power" over the door indicates that something a bit different from the traditional auto mechanics is being attempted. Here we see a student setting up the pulse jet engine for a test run.

In the small engines area a student is testing a wankel engine on the small engine dynamometer. Nearby two students are testing outboard motors in the test tank.

Other students are working with more exotic forms of power such as the thermoelectric generator, the fuel cell and solar cell. The solid fuel rocket engine test unit allows students to fire rocket engines and study their performance characteristics before launching the model rockets they have made.

Still having an important place in the power program is the automobile and small truck engine, including the diesel. All work on these engines is done on engine stands. Only by special arrangement do students bring their own cars for work. (This is usually done after normal class hours.)

The next stop in our tour is the drafting and design lab. The most impressive part of this lab are the sixteen autoshift tables with track-type drafting machines.

Two types of activity are found here. First are those students who have a desire to explore drafting, both machine and architectural, in depth. The second group are students from other labs in the building who use the drafting room as a resource area as they work on the design of their work or put their ideas on paper. A student working with woods may be here for assistance in designing a desk he wishes to build.

Another student may be here making display drawings of a cut-away model of an automobile transmission on which he is working. Still another student from the power lab may be designing a rocket that he will launch.

Our next area on the tour is the electronics area. Here students are working in diverse areas including basic electricity, radio circuitry and computer circuits. Students may be working in teams or individually, depending on individual needs. A separate testing room is provided for that very noisy signal generator work. A ham radio shack is also provided but will not be equipped until student abilities are expanded.

We continue to the research and development lab where we meet several students working on individual studies, each of their own choosing and design. The first is experimenting with the making of solar cells. The materials were provided by the Ohio Bell Telephone Company.

Two girls are in the lab today trying to make glass from raw chemicals. They are chemistry students who work in the industrial arts area two days a week on research projects. Three other girls, also from the chemistry class, are getting some advice from an instructor on several kinds of wood they want to study chemically.

Nearby is a junior who has become very interested in fluidics. He has read widely in the area, corresponded with numerous persons, attended a national fluidics trade show and made personal contacts with specialists in the field. He is now making his own fluidic components and has one that operates.

In the small materials testing off the R&D lab are several students working preparing samples for study under the metallurgical microscope. Several others are testing wood joints on the universal tester.

The final lab on our tour is the manufacturing lab. Here we find a wide range of activities. Here is a girl working on modular storage units she will use in her college room next year.

On the other side of the room is a student adjusting the TIG welder prior to welding some aluminum. Other students are working with traditional arc and gas welding. Included here are two girls learning to weld so that they can make welded sculptures.

Also in this end of the manufacturing lab is the metals machining area. If we were to return to this lab in the afternoon we would find a group of ninth graders setting up their mass production problem. One group is now getting ready to go into production with a chess set they have designed. They are part of a group of approximately 75 students with four instructors working as a team with them.

In making their chess set these boys have designed each piece so it can be made with common woodworking machinery. Their stock is planed, ripped to width, cut to length, and designs cut into each piece on the circular saw and band saw. Each piece is rough sanded on the belt sander and then inspected and finish sanded. A couple of students, obviously chess buffs, are in the corner playing a game on the prototype board with a set of rough-cut pieces.

Another student is working on the design of a package to hold the chess pieces when they are sold. His design team will later go to the visual communications lab where they will print the package.

These students, before setting up their production line, started with a lab completely bare of furniture. With only a couple of exceptions, the woodworking equipment is portable and can be arranged where the production line dictates. Some of the equipment is stored out of the way and brought out only when needed.

While this group of students is setting up their production line, other groups are working in the resource and instruction center. Here several of the team instructors are helping them work out the various problems.

As you can see there is a wide range of activity covering many levels of student achievement.

This is possible through the concern of the Warrensville Heights industrial arts staff to present a very flexible program, one which meets students at their present interest and ability levels, one which in turn takes each student forward from his present position.

We enroll students in industrial arts only.

They do not register for a specific area of work such as woodworking, or metals or printing. By not narrowing the student down to a very narrow subject field he knows that he may, if the need arises, move from area to area as his problem explorations demand.

This also frees the teacher from the hang-up of feeling that a student must be kept in woodworking because he has requested for the area and his permanent record will show a grade for woodworking.

Several examples of this flexibility in action can be found in our labs today. Two of my machine drafting students are working in the manufacturing lab trying to make some of the machine parts they have been drawing. Needless to say they will come out of there with a much better understanding of the meaning of the terms drill, counterbore, spotface and ream.

A welding student, by using a universal tester, soon learns the difference between a strong weld and one that has been poorly executed.

We encourage our students to work in several different labs with the several instructors. Our one requirement to this movement is that the move be relevant to the student's work. A student is not allowed to move just because he thought he could get by with little or no class work and now finds that this is not the case.

Mr. Bame teaches at the Warrensville Heights (Ohio) City School.

Teaching industrial production

Gerald L. Steele

For about five years the Department of Industrial Education and Technology at Ball State University has been presenting a course entitled "Industry in a Contemporary Society" which is a study of how industry operates. This course was basically designed as a service course for the general education requirements. Recently we have instituted a similar course for undergraduate majors in industrial education and a graduate course for our majors. We have found it advantageous to separate majors and non-majors in this effort in order to alter the emphasis for each.

Although this course has changed considerably over the years, the basic objective has remained the same – "the understanding or interpretation of industry."

The definition of industrial arts as set forth by Dr. Gordon O. Wilber a number of years ago forms the basis for our approach to this course. He said:

> ...Industrial arts will be defined as those phases of general education which deal with industry – its organization, materials, occupations, processes and products – and with the problems resulting from the industrial and technological nature of society.

The definition as suggested by Ivan Hostetler in the USOE conference report, "Improving Industrial Arts Teaching" (1965), further supports our work.

> Industrial arts is a laboratory – classroom experience designed to orient students to our technological culture. Problem solving through analysis, planning, designing, production and evaluation is the basis for laboratory activities.

Dr. Hostetler stated four objectives which should be emphasized. They are presented here in reverse order.

Objective number four is that of developing "... a measure of skill in the use of common tools and machines." Industrial arts today, by and large, does a good-to-excellent job of this.

Objective number three is "to develop technical problem-solving skills related to materials and processes." This is accomplished to a fairly good degree in most industrial arts programs.

Number two deals with discovering and developing "... talents of students in technical fields and applied science." This is usually accomplished to a less than desirable degree.

Objective number one is "To develop ... an insight and understanding of industry and its place in our culture." If there is one objective which is least met in industrial arts today, this is it. We are doing a poor job of this, save for the new approaches to industrial arts. This is the one objective – "the interpretation or understanding of industry" – that the new approaches such as IACP, American Industry, Maryland Plan and others are trying to satisfy. So are we.

The five objectives of industrial arts set forth by the AVA are similar. Paraphrased they are:

(1) Insight and understanding of industry.
(2) Discover and develop talents, aptitudes and interests.
(3) Understanding of industrial processes.
(4) Develop basic skill... (with) tools, machines and processes.
(5) Develop problem-solving and creative abilities.

The same comments can be made about our attainment of the AVA goals. We do least to satisfy goal number one, understanding industry.

This goal does not imply teaching just mass production. It does, however, imply we must study the entire spectrum of industry. To what degree we study each facet of industry is left to us.

In the three courses at Ball State we are not just teaching mass production. To do so would ignore these other facets of industry. Our courses for majors and minors are really methods courses which are a part of our professional sequence. Processes and materials are of minor importance. They are taught in the technical courses within our department.

The idea-to-dollar profit sequence and its achievement has become the pattern for content. This sequence and all its intermediate steps and ramifications are studied.

Industry can be broken into five basic functional areas which cover the total of its operations. These functional areas or facets of industry are research and development, production, marketing, finance and control and industrial relations. Each of these have interrelationships which are also studied.

Research and development is the idea stage. It has three sub-functions. They are research, development and product engineering. Research is the area of exploration, while development is that of taking the research and developing it into a product idea. Product engineering is taking the product idea and developing it into a marketable product.

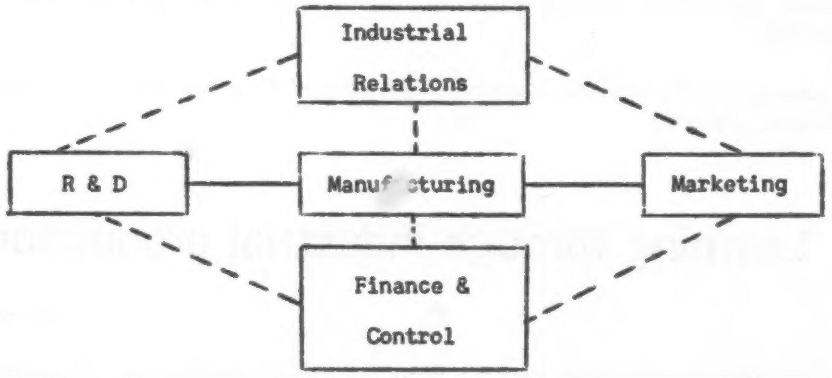
Production is subdivided into five sub-functions, manufacturing engineering, production planning and control (PPC), plant engineering, manufacturing and quality control. Manufacturing engineering plans the methods, tooling and manpower needs. PPC prepares, issues and checks on the scheduling of production. Plant engineering specifies, approves, installs and maintains the plant and facilities necessary. Manufacturing makes the parts, assembles and packages them. Quality control establishes quality standards and maintains a check on them throughout production.

Marketing is the third facet of industry studied. It has to do with market research, advertising, sales promotion, sales planning, sales operations and product distribution. Marketing research gathers and analyzes facts relating to the sale of products. The campaign will entail the advertising in non-personal media and the personal selling of sales promotion. Sales operations handles the actual sales, while distribution entails the physical movement of the products.

Finance and control is the next activity area under consideration. It consists of three areas – finance, control and purchasing. Finance deals with securing of necessary operating funds. Control maintains records of all funds, inventories and sales and prepares reports on the same. Purchasing secures the needed materials, supplies and services for operations.

Industrial relations deals with the employment of people, wage and salary administration, employee relations, maintaining employee services such as benefit plans, etc., and the organization, planning and development of the company.

All five facets of industry are interrelated as shown here.



Note the direct line from R & D through Marketing and the functional relationships of I R and F & C.

Operating throughout all of these areas are the functions of management – planning, organizing, directing and controlling.

Now one will ask, "How do we do it aside from talk about it?"

First is a pre-planned mass production experience. It introduces the student to how products are made. It will usually appear near the beginning or sometimes towards the middle of the course and is teacher-prepared.

A brief discussion of the history of industry is followed by discussions of the five facets of industry as outlined previously.

Several R & D groups are organized with about four to six persons in each group. The entire class works on R & D at the outset. Each person prepares several ideas which are discussed and reduced to one idea per person in the group. These ideas are presented to the class as a whole and reduced to one per group, which is then developed further. A market analysis, cost analysis, production analysis and prototype of each is made. These are presented to class again and reduced to one or two products which will be produced.

Criteria for product selection may be summed up by these:

(1) Easy and fast to produce in industrial arts.
(2) Low-cost materials used. Try to keep selling price under $2.00.
(3) 100% mark-up.
(4) Students capable of doing the operations.
(5) Lends itself to continuous line production.

A corporation is organized consisting of four divisions – production, marketing, finance and control and industrial relations. Each organizes itself along the lines of its sub-functions and is headed by a vice-president. A company president is elected. The whole class becomes the board of directors. Normally they are also the exclusive stockholders. Stocks are sold. The instructor becomes the chairman of the board with absolute veto power, if needed. As all have been involved in R & D, this division is not formed.

Each student is charged with the responsibility of reading at least three reference chapters relating to his specific duties. Each department develops appropriate forms and materials necessary for operation.

Capitalization is determined by the product selected and how much material needs to be purchased for cash. Credit is used wherever available. A company name is selected. The production division develops flow charts and diagrams, jigs and fixtures, and quality control devices. Finally they produce a product. Marketing promotes, sells and distributes the products, finance and control keeps the records, and industrial relations employs, trains and pays the workers. Pay usually takes the form of a product plus a fictitious check for labor during production.

A pilot run is made before final production begins. During this run, the bugs are ironed out and tooling revised. Each worker is then trained for his specific job.

The goal for production is usually about 100 units, although if more are pre-sold, more are made. On this basis, 75 units should bring enough profit so each can have one unit free. Generally, the whole class sells the products.

A final accounting is made, and, if a profit is realized, stocks are liquidated for face value. Losses are deducted from this.

The goal of this course is to simulate industry. The degree to which this is done plus an objective test or two on the functions of industry are the basis for the grade.

The whole path from idea to profit is stressed again and again. This is what makes industry operate.

Mr. Steele is assistant professor in the Department of Industrial Education and Technology, Ball State University, Muncie, Indiana.

Learning through industrial production

F. Victor Sullivan

Before beginning to discuss the use of industrial production as a learning experience, let me first look briefly at the goals of industrial arts. We in industrial arts have a variety of sources of goals. I am sure you will all know of the lists provided by the AVA, the works of Gordon O. Wilber, Ivan Hostetler and more recently by such new curriculum approaches as the IACP, the American Industry Project, the Maryland Plan and Southern Illinois University.

I have been privileged this past year to work as a Sessional Lecturer in the Department of Industrial and Vocational Education at the University of Alberta in Edmonton, Alberta, Canada. At the University of Alberta I have found another set of goals for industrial arts which I feel every industrial arts teacher should study. The U. of A. goals as developed by Dr. Henry Ziel and the staff of the department are as follows:

> Industrial Arts has been conceived as that part of a general education which lends understanding to the technological and industrial aspects of Society.
>
> Objectives –
>
> (1) To provide an environment where students can reinforce and apply the academic disciplines.
> (2) To provide exploratory experiences in the various productive aspects of society
> (3) To provide a synthesizing educational environment.
> (4) To provide an introduction to the multiplicity of career opportunities
>
> (Research Report I, 1966)

You will notice a number of areas of commonality with these and the various US sources mentioned earlier.

Of the slight differences, one of the most important is number one, "to reinforce and apply the academic disciplines". Regardless of how you may feel about "pure vs. applied", "general vs. practical" or perhaps "bookish vs. workish", the fact is that many IA teachers I have known in the US either ignore the "academic eggheads" or tolerate them. What a mistake! I have found it refreshing to find IA making a positive, public statement that we do in fact relate to the other areas of the curriculum. It is in the IA lab that the application of what goes on outside of the "shop" takes place, with or without our direction. Imagine what could be accomplished if we directed just part of our efforts to the advancement of such a goal. I could carry on much longer about how IA should relate to the rest of the school, but my task today is to look at another facet of IA – how does or may industrial production relate to the conventional industrial arts program?

For the limited time available, I have chosen to use a definition of industry adapted from the Industrial Arts Curriculum Project of the University of Illinois and The Ohio State University. Industry is that portion of productive society that produces consumer products by making changes in raw materials. I realize that such a definition is more narrow than many would use but I think it fits the existing knowledge of many teachers and programs in the public schools. It does limit the goal of "understanding industry" which almost all IA teachers accept but I am willing for now to allow a narrower scope as a transfer stage in the curriculum.

There are many methods of learning about industry, especially about materials, tools and processes. However, there are few experiences which allow a student to experience the interrelationships between all of the facets of industry. In a unit shop the student may learn about industrial materials and about the skill required to make changes in materials by the use of tools and machines. In a general shop, or perhaps in a series of unit shops, a student may learn about the combination of materials. If we are lucky he may learn about the relationships between materials. Under the direction of a good teacher he may gain the concept that many of the cutting, fabricating and finishing processes used on one material may be basic to a wide range of materials. The one area of production upon which the vast majority of industry depends in our modern technological society is the line production system. Not only must equipment and machinery be modified to allow for line production, but also must the organization, the relation of man to technology and of man to man. It appears that the concepts in this area are of greater importance as we look forward to tomorrow than all of the rest. Machines may take over the skill tasks, but the organization and operation of the production system is less subject to change.

How can a teacher go about providing an environment which allows students to explore this aspect of productive society? Clearly it cannot be done by teaching a craft-oriented unit shop pre-vocational course. In fact such depth, especially at an early age, may well produce inhibitions which will prevent the learners from attaining an overall view of industry. I have seen the individual craftsman at work at his task and I too sometimes decry the decline of such skill, but it becomes increasingly clear that such work is not representative of productive society today nor more importantly of tomorrow.

Consider the following problem please. If you teach a 7th-grade classroom, just think of the "lead-time" before your product, the learner, reaches the market – the world of work. He must complete two more years of junior high school plus three years of high school before he can even hope to enter the labor force. In rapidly-increasing numbers of occupations, the worker must have a minimum of two years of post-high-school technical education. If the student chooses to attend college we must add four to five more years to the "lead-time". If mathematics hasn't changed since I was in school, the "lead-time" minimum for an unskilled or semi-skilled job is five years. If he goes to college, "lead-time" becomes a minimum of nine years. Patently the teacher's task when measured by the industrial yardstick of "lead-time" is a very serious matter. Industrial arts cannot continue to teach a divided unit shop type of curriculum for students entering the work force in 1975.

We must begin to provide an environment in which to study industry in the same way that NASA attempts to prepare men to walk on the moon – we must do it by simulation. We cannot equip a lab with the same machinery and accessories as does industry, but we can intentionally present an environment where students are able to simulate the procedures of industry. I said intentionally because I am disturbed to see many teachers intentionally providing just the opposite.

Bruner (1960) calls for an educational environment that will provide the structure or the overall view of subject matter. After seeing the "big picture", the learner may begin to study the components of the total system.

In the study of industry it appears to me the logical first step in providing such an environment is to provide experience in the overall view of industry first, i.e., industrial production.

A number of IA teachers have been using production experiences for many years; it is not new. The problem is that not enough teachers are providing such experiences. If your curriculum has not provided for production line experiences, you should seriously consider one or more of the following procedures:

My first suggestion is to start the class on the first day of class with a line production unit. Such an experience provides for the overall view of the interrelation of equipment, materials and personnel. The product chosen for such a first experience should be characterized by simplicity. Experience has shown that about three parts is close to the optimum number. The teacher must have the complete production organization, materials flow, jigs and fixtures pre-planned prior to the start of class. The students should be provided with job training the first day and allowed to operate the line production the second day. A seminar session the third day will provide a review of the production and an opportunity for the teacher to emphasize the concepts he wishes learned.

A second suggestion is to use a mass production unit which differs from line production. Line production generally means that each product progresses from raw material through to final packing. Mass production has generally been a term that means the product is assembled from previously-produced parts. Thus mass production allows the assembly of purchased parts or the production of individual parts to be stockpiled for later assembly.

Max Lundquist, an IA teacher in Pittsburg, Kansas, has used another approach with students in his junior high.

Mr. Lundquist's students make the individual parts by line production and then do individual assembly. Such a process allows individual modification of products, the production of more complex projects and an industrial production experience without the need for inexperienced students to design and construct complex jigs. Mass production also represents the type of industry found in almost all communities – the small job shop.

A third approach is to do the complete industrial organization. Such an approach was used in the Kansas State College of Pittsburg NDEA Institute in the summer of 1967. In the institute the participants took the place of junior high students to complete such learning experiences as design and presentation of the product, design of jigs and fixtures, production planning and scheduling, finishing, company organization, labor organization, and, of course, labor-management relations.

The "proof-of-the-pudding" occurs when activities such as I have tried have been successfully completed in the public schools, by public school teachers. They have!

Many teachers are enriching their industrial arts programs through industrial production. You can also. Industrial production, Phase III, Enterprise, or whatever you call it is not the answer to all of the problems facing IA teachers, but it is surely a good place to start a modification of many IA classes, or, if I may be so bold, of many manual training classes.

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3

Co-ordinating curriculum in junior and senior colleges

Walter J. Hall

One of the striking contrasts between the junior college and senior college is the great variety of resources – both material and human. It is said, 'our public education must concern itself more with the average student who does not wish to become a doctor, lawyer or engineer. For these average students the situation is, if anything, worse. For competence in dealing with life's problems, they must depend on what they have learned in twelve years from ages six to eighteen.

We are aware of the statistical data which reveal that the educational population is increasing at a rapid rate; changes in the educational techniques from the elementary through high school levels exhibit a trend for exploration to higher learning for the majority of the students presently enrolled in school; higher entrance standards for entry into senior college, along with financial obligations – these create very important factors in the development of the student's pursuits of his education. It is obvious that we must first establish an environment that will be conducive for the student to advance into this vast industrial world.

Benjamin Disraeli, a British Prime Minister of England, in a speech to the House of Commons said, "Upon the education of the people of this country, the fate of this country depends." This statement clearly defines our fate as a nation among all nations.

It is impossible to attempt to define curriculum, although it is obvious that the curriculum is derived from experiences which the students undergo within the culture of the junior or senior college. Content and method can no longer be regarded as separate entities. New career opportunities for college graduates require continuing examination of courses of study. Knowledge of how students choose careers and the constraints upon their motivation is vital to curricular innovation. Therefore, with the growth of community junior colleges throughout the nation, it is of vital importance that the senior colleges and universities recognize this growth and work toward a closer correlative program of industrial arts education.

Let us look at the ladder of industrial arts as it appears today: First, the elementary school. Here the industrial arts is closely correlated with the basic units of the elementary school so that the results will be an integrated program of education. It is obvious that the curriculum is not based on units to be covered on specific subjects, but on pupil growth and development. It is evident, then, that industrial arts becomes a physical amalgamation of all subject areas. Second, the junior high school. Here the industrial arts program is the most diversified of all and offers youth a variety of experiences in organized laboratories. These laboratory experiences provide the students with basic exploratory experiences in using tools, materials, processes and products of the major industries. It is at this level that the student is provided with an opportunity to plan, experiment and work in the major activities of industrial arts. As a result, the student can assess and understand his interests, abilities, limitations and potential in our industrial society.

Next, the senior high school. It is here that industrial arts makes a unique contribution to the total school educational program as it interprets the functions, technology and occupational opportunities of our modern industrial society. It provides the student with the opportunities of our modern society to study about industry, materials, fabrication procedures, methods of communication, energy and propulsion, and personal services as they relate to the industrial and consumer use of finished products. Here students see and experience the unity or wholeness of modern industry.

The industrial arts program at the senior high school level enables a student to go in one of two directions. The first, a lateral curriculum approach, enables the student further to explore additional kinds of work in which he may be interested or which are suited to his objectives. The second, a vertical curriculum approach, offers the student an opportunity to concentrate and specialize in a selected field of industrial work. As a result, for some students the program provides a broad general background, while for others it provides pre-occupational experiences.

This now brings us to the next to last step on the ladder, that of the community junior college and senior college; it is at this level that industrial arts contributes to the liberal education and technical competencies of students. Technical courses provide a sound base for those interested in industrial education; it is here that the student may choose from these distinct groups: (1) prospective teacher, (2) liberal education, or (3) industrial arts as a related area. The primary function at this junction is the preparation of industrial arts teacher; thus the curriculum is divided into two areas, one being those courses related to the development of skills and technical know-how, and the second being courses in the professional realm.

We must conclude then that the student has had a good chance to observe industrial arts by visual concepts, long before he was able to proceed to the next step. It is evident then that we as instructors, professors and counselors display evidence to those students, an image of industrial arts that might be conducive for further exploration – that being, keeping abreast of the changing industrial society and the current philosophy of our youth.

It is obvious then that the elementary school, the junior and senior high schools are fulfilling their goals toward the education of the total child. Are we as college instructors doing the same? Are we meeting the great challenge of "change"? Can we truthfully say that our courses of study project into the industrial world of tomorrow? These and many other questions must be answered if we are to establish an industrial arts program for the many prospective teachers to follow.

With the ever-increasing number of community junior colleges being established, the senior colleges offering industrial arts curricula must prepare to challenge the threat of an industrial pursuit to that of teacher education. Knowledge of how students choose careers and the constraints upon their motivation is vital to curricular innovation. The transition from junior college to senior college causes a great change in each individual student. Once the curriculum has changed, student participation and achievement cannot be left to happenstance. Each college must find ways to inspire and promote student interest and create conditions in which students can succeed. These are but a few conceptual vehicles the junior college and senior college may use to enhance the coordination of the curriculum: (1) Programs for orientation of junior college teachers; (2) pre-school or post-school conferences; (3) comprehensive programs; (4) university and college programs; (5) consultants; (6) support of in-service education; (7) workshops. All mentioned should be flexible in nature and planned cooperatively by both the junior college and senior college.

Careful surveys should be studied, since communities from which a college draws its students should be a center to cultivate interest in new careers. A college can assist students and parents by familiarizing them with the faculties and staffs of feeder schools with new jobs and careers, and with preparation offered at the senior college. Also, the senior college can provide speakers for student and community groups and encourage students as well as parents to visit the college. This invitation should not be confined to the graduating seniors or parents, but rather to the entire school systems, since children entertain notions about their vocations long before high school graduation.

Since the average student attends the junior college in his vicinity, he never experiences the transition of other college students who move from high school to senior college, as he enters the senior college as a junior. The student does not experience the long drawn-out orientation programs or other programs the freshman students encounter, since this has been experienced at the junior college level. In the light of this, the graduate from a junior college does not expect to be treated as a so-called "freshman".

Traditionally, college orientation has concentrated on welcoming the new student and seeing to it that he becomes familiar with his surroundings – persons, rules, procedures and buildings – and that he conquers home-sickness in short order. It seems more relevant to his matriculation to introduce the newcomer to his new life in scholarship, exploration, experimentation and testing, wider horizons and higher aspirations.

It is true that many authors subscribe to the philosophy that freshmen are not ready to synthesize, and that they are still in an age of analysis; they contend that the failure of general education programs limited to the first years of a college program indicates that the first two years are too early for synthesis. Whether the high school preparation, the level of maturation, the lack of communication between high school and college faculties, or whatever else be the cause, students do not appear to reap the benefits so bravely predicted for them. Perhaps, therefore, general education should be chiefly in the junior and senior years, after the student has collected the basic knowledge of his field and has become curious about its relationship to other data. It is obvious that faculty will be alert for the freshmen and sophomores who are ready and eager to begin reflection on what they have learned, and therefore are suited to general education courses. It is here that a close communication system should be established between the junior and senior colleges.

We must constantly examine the academic program of an institution. We must know about growth and development in fields of learning; and we must know about the burgeoning jobs that require new or revised curricula to prepare students for them. This is primarily the domain of the faculty, even though we must encourage other administration, members of the governing board, students and alumni to submit ideas for change. The campus atmosphere must be one of constant search for new and better curricular ideas as well as for styles, methods and materials of instruction. More generally, it must exhibit a real resolve to improve its academic program to educate its students and to fit them for new career opportunities open to them. This requires an awareness of new and developing employment available to graduates and the skills they need.

It is evident then that in order for there to be close coordination of the industrial arts on the junior and senior college level, good communication among faculty, administration and students should be stressed at all times. This aids in creating a stimulating, intellectually-alert campus.

At Prairie View Agricultural and Mechanical College the total curriculum outline for a major in industrial arts teacher education has been developed. A complete explanation of required hours in academic foundation courses, industrial arts core courses, professional education courses and industrial arts specialization courses is clearly defined; copies of the curriculum outline in industrial arts teacher education have been sent to counselors of high schools and junior colleges throughout the state; additional information is issued to interested students on all recruitment tours. This detailed curriculum program has done much to clarify the courses and hours required for a major in industrial arts teacher education. In addition to the industrial cooperative program, the department is presently initiating multi-media centers for closed circuit television, this informational instruction being available to the high schools and junior colleges.

While the emphasis throughout this presentation is upon the total college curriculum, it is evident that we suggest a curriculum that will be highly relevant to human society and its problems, that will involve students actively in the learning process, that will contain activity-centered instructional procedures, and that will permit highly flexible teaching and learning techniques.

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Co-ordinating the curriculum in Hawaii—junior college, senior college and the State Department of Education

Lawrence F. H. Zane

Considerable interest was shown in public education and teacher training in Hawaii during the 1965 session of the State Legislature of Hawaii. Among the legislative actions affecting education was a Resolution adopted on March 31, 1965. It requested a comprehensive review of education programs to prepare teachers and other educational personnel in Hawaii. Specifically, this resolution requested the University of Hawaii to report its findings and recommendations to the 1966 budget session of the Third Legislature. Dr. Lindley J. Stiles, Dean of the School of Education from the University of Wisconsin, was asked to serve as consultant. He had a supportive staff and an advisory committee.

As a result of this appraisal, the University Council on Teacher Education was established in 1966. This council has university-wide representation. The administrative responsibility of this committee rested with the College of Education. It includes administrators, faculty members and students drawn from all of the colleges at the university which participate in teacher preparation. It also includes representatives from the State Department of Education.

In order to initiate specific proposals for teacher preparation, and to assure a broad review of all policies affecting the curriculum in all of the subjects commonly taught in the public schools, ten teacher education committees were constituted (see chart 1). Curriculum proposals from these committees are reviewed by the council and the College of Education Senate and the dean of the college before they are finally approved by the Council of Deans.

One of the ten committees formed was the Teacher Education Committee on Practical Arts Education. This committee is a standing committee appointed by the president of the university. It includes business and distributive education, home economics education, industrial arts education, trade and industrial education, and vocational agriculture.

In May, 1968, the sub-committee on industrial arts proposed a partnership program for the preparation of industrial education instructors. This committee, made up of the state supervisor of industrial arts, the chairman of the College of Education Industrial Arts Department and a member of the College of Engineering, proposed that the University of Hawaii work with the Community College System in the preparation of instructors.

How did they develop this proposal? The committee agreed to several essential ingredients necessary to any articulation program: One, a mutual attitude of respect and cooperation among the people involved; and two, an atmosphere of interdependency among the three institutions involved - senior college, community college and the State Department of Education.

Specifically, the committee proposed:

(1) That an industrial education coordinating committee be established.
    (a) That this committee be composed of:
        The state supervisor for industrial arts
        Two representatives from the community college
        Two representatives from the College of Education
        A representative of the Hawaii Industrial Arts Association
    (b) That this committee have the responsibility for:
        Arranging coordinated work experiences for teacher trainees
        Obtaining grants, scholarships, loans, etc.
        Selecting and designating community college instructors and administrative staff to advise and instruct students in courses conducted at the community college
        Developing and implementing evaluative procedures
        Directing and implementing articulated programs in industrial teacher education.

(2) That the minimum requirements for a Bachelor of Education degree major in industrial education include:

(a)	General Education core	60
(b)	Technology core	36
(c)	Professional Education	24
(d)	Industrial Education	6
		126 cr. total

(3) That selected courses be offered by the Community College System in technological areas and that these be accepted as a partial fulfillment of the bachelor's of education requirements with a major in industrial education technology core - minimum of 3 credits each in the following areas:
    (a) Electrical
    (b) Electronics
    (c) Power
    (d) Wood or construction
    (e) Metal
    (f) Drafting/design
    (g) Synthetics and/or industrial crafts Total 18 credits
    Minimum of 12 credits (3+9) in two of the above areas or
    18 credits
    Minimum of 18 credits in one of the above areas 15 credits
    33 or 36 credits

The UCTE approved the proposal for a partnership program for the preparation of industrial education instructors at a meeting on December 19, 1968. On February 12, 1969, the College of Education formally approved and accepted the proposal. Several preliminary meetings were then held to work out the details needed to implement the plan.

As a result, the Honolulu Community College has agreed to offer five of the technology core courses in the fall of 1969. All students in the program will be scheduled together as a group. Late afternoon classes are anticipated to accommodate in-service instructors.

In addition, the Department of Education has initiated a state-wide program to familiarize high school counselors with the new program.

Hopefully, this partnership action taken by the State Department of Education, the Honolulu Community College and the University of Hawaii will provide the needed pool of prospective industrial arts teachers.

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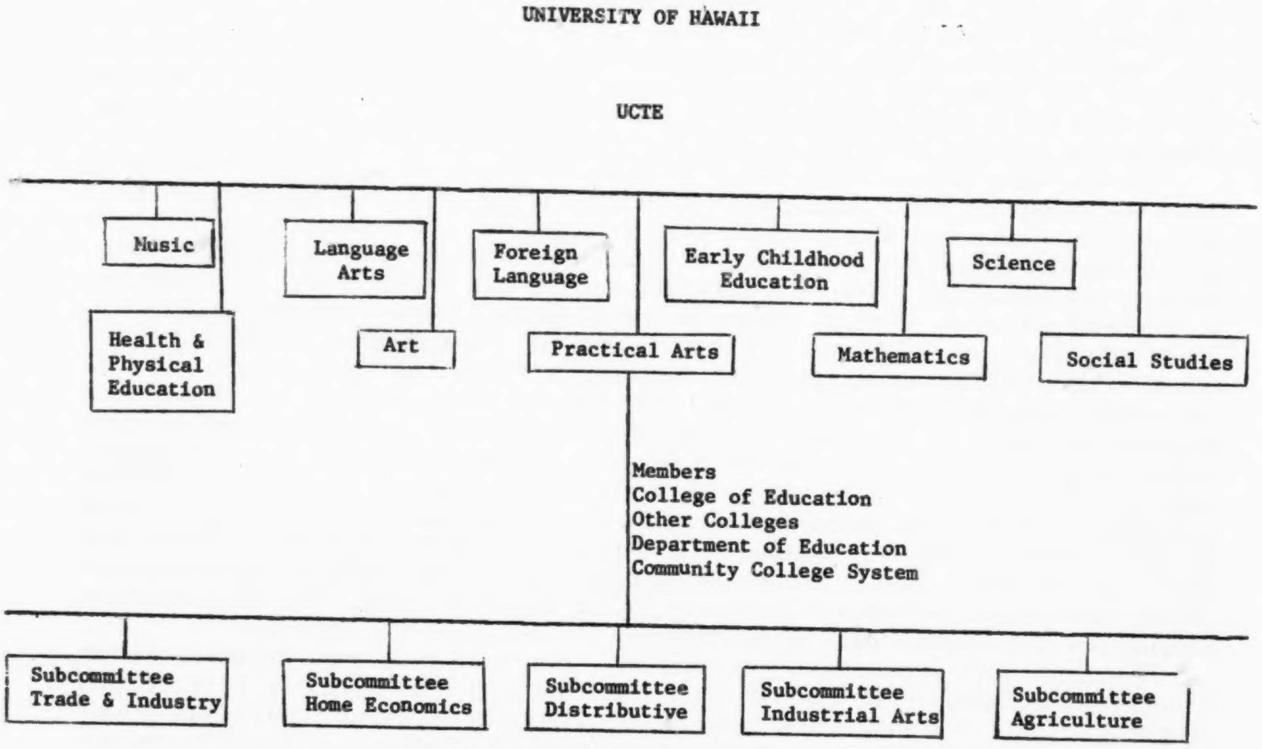
UNIVERSITY OF HAWAII
UCTE
Music
Language Arts
Foreign Language
Early Childhood Education
Science
Health & Physical Education
Art
Practical Arts
Mathematics
Social Studies
Members
College of Education
Other Colleges
Department of Education
Community College System
Subcommittee Trade & Industry
Subcommittee Home Economics
Subcommittee Distributive
Subcommittee Industrial Arts
Subcommittee Agriculture

Chart I

Implementation of the Galaxy Plan in an inner-city high school

Kenneth R. McLea

We are beyond the stage where a rigid course of study or curriculum will fit all students passing through our shop programs. Rather, a more flexible, more diversified course of study is a must if we are to reach more students, make our courses more relevant, and meet the needs of students in our comprehensive high schools. It should be remembered that the students in our shops today will be running the world of tomorrow, and, with technology changing so quickly, what will our students need thirty or forty years from now to function in that world?

I am sure that we all realize that technology is changing so fast that even the plane which brought you and me to this convention is already obsolete; that, at this very moment, if we were using the old system of a telephone operator asking, "Number, please," we would have to employ every woman sixteen years and older just to complete the 300 million calls placed every day in this country. Are we really training youth for a world which will be – who knows where! Business, medical, scientific and industrial changes are accelerating at such a tremendous rate that if we don't move fast in our schools, we may find tomorrow leaving our children in the dust.

Here are some predictions which I am sure are self-evident, but which need repeating often: (1) Many jobs will be taken over by automation. This means more education for more engineers and technicians; (2) Service occupations will be on the increase, such as, recreational workers, doctors and medical aides for a world which will be more people-centered; (3) Increased leisure time and prolonged life will mean educating for more free time; (4) Huge educational complexes serving the whole community on a 'round-the-clock, year-'round basis. Gone will be the days of five periods, a preparation and a homeroom between 8 a.m. and 3 p.m.; (5) Upgrading and training of teachers will be a continuing process; (6) Mass education will become more individualized.

To quote Dr. J. Lloyd Trump, associate secretary of the NASSP, "Teachers must adopt new roles to accommodate new trends and innovative practices in the attainment of three crucial, important educational goals; (1) individualizing pupil learning; (2) professionalizing teaching; and, (3) refining curriculum content." Dr. Jensen, a noted psychologist, has stated that it is wrong to expect a single educational method to succeed equally well for all types of youngsters. It has often been said that trying to change education is like trying to move a one-hundred-year-old cemetery, but can we afford to wait?

The innovative ideas of the Galaxy Plan in industrial arts education are one means by which the industrial arts department can move into the mainstream of the general education picture. Industrial arts education need no longer be "that" course taken because a certain student should get away from the "academic" subjects and work with his hands. Industry and technology are our way of life in America, and industrial arts is as essential to the total education of every student as social studies, mathematics or the sciences. We in industrial arts are the teachers of our way of life. Our standard of living is determined by the products industry produces, the services industry provides, and the comforts and conveniences of everyday life derived from these products and services. I have been accused, and rightly so, at times, of being a dreamer because I can envision the day when industrial arts education will be the focal point of a general education in a comprehensive high school and will be supported by the amount of language, mathematics and science necessary to develop an understanding of the functioning industrial technology in which we live. After all, doesn't education become relevant when it is directly concerned with life? As Governor Reagan of California stated in a talk to the California Industrial Education Association convention in Fresno on March 15th of this year, "We must, together, develop new relationships between technical education and general education."

Now, let's look at industrial arts education as outlined in the introduction to the San Francisco curriculum study of last year. Industrial arts is an integral part of the total program of general education, and is designed specifically to prepare individuals for our industrial-technological culture. In this program, which involves study, experimentation and application, students learn through participation in activities in which they use industrial-technical tools, machines, materials and processes, as well as language arts, mathematics, science and social sciences, in solving meaningful problems.

The four major purposes of industrial arts are to provide opportunity for each student to develop; (1) Insight and understanding of industry and its place in our society: (2) talent in industrial-technical fields; (3) technical problem-solving skills related to the materials, processes and products of industry; and (4) skill in using tools and machines proficiently and safely. These purposes are furthered by a program in which emphasis is placed on helping students acquire the knowledge and skills basic to many occupations and professions.

In grades seven and eight of the junior high school, the industrial arts program is an integral and often-required part of the total program of education for all youth. Students are usually guided through a series of introductory experiences in a variety of industrial arts areas. In these grades, emphasis and attention are given to helping students discover and further their aptitudes, abilities and interests. Provision is made for students to acquire a variety of skills and to profit from participation in creative activities.

In grade nine of the junior high schools and grades ten through twelve of the senior high schools, the industrial arts program provides opportunity for a student, regardless of his major, to choose the industrial arts courses he believes will be of the greatest value to him in attaining the goal he is seeking. Included in the program are elective courses which provide basic and advanced instruction in automotive mechanics, drafting, electricity/electronics, graphic arts, metals, power mechanics and woods. The advanced techniques developed in these courses approach the procedures used in industry. Challenging opportunities are provided for scientifically- and mathematically-oriented students to work and experiment with new materials, processes, ideas and designs.

Knowledge and skills acquired and the experiences gained through participation in the industrial arts program assist individuals to select careers wisely and to participate successfully in programs of education and training offered by institutions of high learning, industry and government which provide further preparation needed for chosen career.

How does the Galaxy Plan in industrial arts education fit into this particular philosophy?

To understand the Galaxy Plan, we must first think of it as a broad-based approach for occupational education for grades seven through twelve. This program is planned so that it would be meaningful and essential for youth (1) going on to colleges to prepare for the professions in such areas as science, engineering and industrial education; (2) going on to community college or technical institute to prepare as technicians; (3) entering an apprenticeship in the trades; or (4) developing salable skills for entering the labor force directly from high school. It is becoming apparent that industrial arts education could make a significant contribution to this broad-based approach to occupational education and keep abreast of the economic, scientific and technological changes taking place in the industrial world of work. Equally important is that industrial arts education adapt itself to the needs of youth in a technological society. The Galaxy Plan for occupational education, that has been developed by Carl Turnquist and the staff of industrial educators of Detroit and is currently being promulgated by the Detroit Public Schools, provides for laboratories in four major career clusters. They are: (1) Industrial Materials and Processes; (2) Energy and Propulsion Systems; (3) Visual Communications; and (4) Personal Services. Each of these clusters, organized from typical entries from The Dictionary of Occupational Titles, covers a wide range of careers for those (a) going into management and engineering, (b) planning to qualify as technicians, (c) hoping to enter an apprenticeship; or (d) developing a salable skill to go directly into the labor force. The job cluster in Industrial Materials and Processes includes the study of metals, wood products, ceramics and plastics. The occupational cluster in Energy and Propulsion Systems includes the study of electricity/electronics, power plants, instrumentation, and land, sea and aid propulsion systems. The study of Visual Communications would include art, drafting, graphic arts and information storage and retrieval systems, and Personal Services would include health services, commercial foods, clothing services, cosmetology, distribution and protection services. The philosophy is to increase the offerings for students as they progress from grade seven through twelve, thereby giving them the versatility needed to cope with life after high school.

But planning and implementing new innovative programs pose several problems to the educator. One is to have adequate resources requiring funds which are usually beyond those allocated for ongoing programs, and another is that planning and developing realistic educational programs requires experienced teachers, team effort and cooperation of a school system. I am sure that you can all think of many more reasons why innovation is difficult or beyond your particular reach. May I quote from Dr. Dwight Allen, Dean of the College of Education, University of Massachusetts and formerly of Stanford University, in a talk made at the Temple City Education Conference last March: "Who needs to start an innovation? The principal, the teacher, the superintendent or the school board? The answer to that question is, 'yes.' It turns out that there isn't any one person who creates an innovation. But it takes a critical mass and that critical mass, of people, if you will, can include any combination of people, present or absent. Even a student can start an innovation and act as a catalyst. The rule of thumb is that it simply takes that critical mass and that critical mass can surround any one element in the educational community." So, you see we can all bring about innovation; innovation within the existing system. We don't have to tear down what has taken so long to build. Rather, we should retain the main structure and do some shifting of walls, moving of furniture, bending of philosophies, and increasing of hard work to make things happen.

I am a teacher and also Industrial Arts Department Head in an inner-city high school. We have seven unit ships – machine shop, auto shop, electronics, graphic arts, wood shop and two mechanical drawing rooms. All classes are taught by men who are specially trained in their field, in shops specially built for that specific area. Yet, with initiative, imagination and creativity on the part of the department teachers, we are approaching a Galaxy Plan-type of philosophy. As stated previously, grades seven and eight have industrial arts included, in many cases, as a required segment of the total school program, while grade nine, in the junior high school, is the starting point for serious industrial arts majors to select and begin concentrating in one or more of the specific areas. As they enter the senior high school level, the industrial arts program becomes strictly elective, but is varied to involve as many students as possible, not industrial arts majors, and to present the types of relevant experiences they will all need whether continuing their education or entering the labor force upon graduation. The beginning classes in industrial arts are organized to be general, but emphasize basic skills in each area along with the development of attitudes such as: working together, cooperating and following directions which will carry over to assist them in being successful in any endeavor they wish to undertake. The advanced courses branch out into three categories: (a) one hour/day industrial arts courses, (b) two hour/day industrial arts courses, and (c) two hour/day occupational preparation courses. This type of arrangement, we believe, does, to a certain extent, expand the offerings of a straight industrial arts program more toward the type of program which will fulfill the needs of students under the Galaxy Plan. The occupational courses include Machinist Mechanics, Electronics, and Mechanical Drawing. Woods is to be added in the fall, 1969, schedule. The two hour/day industrial arts course is offered in the Graphic Arts area. This program is occupationally oriented, but also is a feeder course to the community college.

But let's not think that industrial arts education stops at the shop door; there are many ways to expand in order to give the students more experiences, more knowledge and more insight into the world of work. One program we use in conjunction with the Graphic Arts class is the "student-in-industry" program. In this phase, two students at a time spend one-half to one full day in industry visiting with the men on the job. It has been our experience that the journeymen welcome the opportunity to explain their responsibilities and processes. This program also works in reverse. We invite industry into the school to talk to and visit with the students.

These programs and others will be implemented and expanded through the development of an Industrial Arts Resource Center. This Center will be used to complement the work and teaching which is being done in the shops. It is planned to divide the Center into three areas: (1) a resource/research area composed of a departmental library, catalog of books, catalog of outside resources, individual study carrels, and A-V materials (single-concept films, slides, filmstrips, tapes, etc.) with necessary equipment; (2) seminar area to be used for student interviews and meetings between students, teachers and industry (particularly advisory committees); and (3) a teacher office/work area for the completion of necessary work by the teachers, counseling of students, "home-base" for student job card files, and for the publication of the I. A. Newsletter. The Resource Center will be supervised by an industrial arts teacher who will not only assist the students as they frequent the Center, but also will (a) arrange for speakers, (b) arrange for field trips, (c) review materials to keep the Center up-to-date, (d) correlate A-V materials, (e) act as a liaison between the department and the advisory committees, and (f) coordinate the work of the industrial arts department with that of the Career Center.

Even though I feel that we are doing a good job of educating our children, there are many ways to improve instruction throughout any school. I realize also that the industrial arts department of the school is only one part of the total picture of education. But in the statistics, we find that 80% of our students will not pursue or complete a Baccalaureate degree, that 40% of all persons between the ages of 18 and 35 who enter the labor force do so with a high school diploma or less, and that in California, for example, skilled labor is being imported from out-of-state because we are not producing the needed manpower. With all this evidence I think Governor Reagan made another good point at the CIEA Convention when he said, "Preparing students for the transfer from school to work requires a greater variety of educational preparation for work and demands new levels of integration of general and technical knowledge and skills." Where better can this integration of knowledge and skills take place than in an Industrial Arts Resource Center geared to bring them together?

For the future I feel that the highly-technical society in which we work and live should be reflected in any new industrial arts educational complex. The new facility should be flexible and adaptable enough to enable the program to keep pace with the world of work. Thus I suggest an industrial arts complex that would consist of seven large areas to be used as follows:

AREA #1 Materials and Processes Lab for the study of metals, wood products and ceramics.

AREA #2 Energy and Propulsion Lab for the study of electricity/electronics, power plants, instrumentation, and land, sea and air propulsion systems.

AREA #3 Visual Communications Lab for the study of art, drafting, graphic arts and information storage and retrieval systems.

AREA #4 Personal Services Lab for the study of health services, commercial foods, distribution, cosmetology and protection services.

AREA #5 An auditorium for large group instruction and demonstrations.

AREA #6 A central area for the storage and disbursal of tools and materials.
AREA #7 An Industrial Arts Resource Center.

The plan for a new industrial arts education complex reflects the great need for providing a facility to stimulate each student and to increase the opportunities for learning.

I would like to leave you with this thought. It is a bit of philosophy which may be appropriate when we are encountering and overcoming problems connected with the implementation of a Galaxy Plan or other innovative ideas and/or philosophies of industrial arts education. This particular sign hangs over the desk of Eve Arden, movie actress, and says: "Today is the first day of the rest of my life."

Mr. McLea is an industrial arts teacher and department head at Mission High School, San Francisco, California.

Galaxy Plan in a rural high school

William W. Davison

The Hugoton Public Schools have been involved in a curriculum study in which vocational agriculture, home economics, industrial arts and business education have been incorporated into one department of Applied Arts and Technology. The department will be interdisciplinary in nature. Common elements in the activities have been identified and developed. By team teaching and staff utilization, the instructor can be utilized in the area of his strongest concentration. Each instructor will work in harmony with other instructors in the department to utilize special talents or characteristics of each particular instructor. The curriculum is designed to be compatible to modern agricultural, domicilic, business, industrial and occupational practices.

In the previously-mentioned disciplines, there are duplications of equipment and coursework, which is monotonous to the student and wastes instructional time. Some of these areas in our study haven't changed in their basic philosophy or teaching methods in 40 or 50 years.

The Galaxy Plan has provided an ideal medium for incorporation of our program. Small rural schools have problems in curriculum development that do not exist in larger schools. Small schools have small student bodies, staff and curriculum, very little industry and sparsely-populated communities, which tends to limit the scope of a school program.

Many prominent programs have been investigated, and the Galaxy Plan is nearest to meeting the needs of our rural youth.

Our program is designed to meet the needs of all students regardless of intentions after graduation from high school. Dependent upon student choice, it can be occupational-, collegiate-, vocational school- or general-education-program-oriented.

It is basically designed around the Detroit Galaxy Plan for Vocational Education and the four basic clusters into which the entire 40,000 job titles in The Dictionary of Occupational Titles can be sub-classified. These titles are Energy and Propulsion Systems, Materials and Processes, Personal Services and Communications. Grouping of titles into these broad clusters will provide a medium by which occupational education and information can be presented to the individual student. The program will use individual broad courses to convey occupational information and provide role playing through laboratory experiences. This will enable the student to make adequate vocational choices as to his future educational endeavors. The program will not be project-oriented by nature, but the primary purpose in the junior high and early senior high will be that of instilling occupational information through experiences of a role-playing nature. Occupational information will not be a unit at the end of the year, but rather an integral part of all the courses.

Skill development can be accomplished by the student during the junior and senior years of high school through concentrated coursework, and occupational experience program, or through a 1/2-day program in a vocational-technical school.

The following are examples of the individual curricular choices a student might make. These are not lock-step channels, but examples of those that an individual might choose to take:

General Education (broad samplings of curriculum)
- Energy and Propulsion Systems
- General Agriculture
- General Business

Job Preparation (using preparation for a carpentry job as an example)
- Materials and Processes
- Drafting and Design (Architectural)
- Construction Machines
- Building Trades – 2-hour program
- 2-hour Occupational Experience Program
- 1/2-day program at the Area Vocational-Technical School

College Preparatory (pre-engineering as an example)
- Energy and Propulsion
- Drafting and Design
- Industrial Machines
- Individual Research and Development

Vocational-Technical School Preparation (agriculture or agriculture-related occupations as an example)
- General Agriculture
- Irrigation
- Materials and Processes
- Livestock Production
- General Business
- 2-hour Occupational Experience Program
- 1/2-day program at the Area Vocational-Technical School

The student program will depend upon the individual student. He will have a program broad enough to offer him several avenues of choice. The choices will be available in the program; the student will have to choose them.

The following configuration represents the grouping of industrial arts, business education, home economics and agriculture under the Galaxy Plan sub-classifications.

Energy and Propulsion	Materials and Processes	Communications	Personal Services
Energy and Propulsion	Materials and Processes	Communications	Household Maintenance
Power Mechanics	Industrial Processes	Mechanical Drafting and Design	General Business
Basic Electricity		Bookkeeping	Applied Business Law
Applied Electronics	Industrial Machines	Shorthand	Office Occupations
	Construction Machines	Typing	Home Living
	Building Trades		Nutritional Meal Planning
	Crop Production Soil Science		Housing and Home Furnishing
	Ornamental Horticulture		Clothing
	Greenhouse Management		Sewing and Tailoring
	Irrigation		Contemporary Living
	Livestock Production		General Business

Occupational Experience Program | Individual Research and Development

1/2-day program – Area Vocational-Technical School

Mr. Davison teaches in the Hugoton (Kansas) High School.

Existing middle school programs

Herbert Y. Bell

The assignment given me for today is to present to you examples, from my experiences as chairman of the middle school committee for the supervisory council, of existing programs of which I am aware in the United States. There are all kinds of variations and directions. Much of what I will be talking about has been gathered here and from correspondence with many people present in this room. I think it's interesting to note that Washington has taken the same direction as has Florida, with developments based on somewhat the same philosophy. Let me delve into these for a moment, and maybe you will have some questions at the end of my presentation.

Certainly some of the newer curriculum organizes the content around human experiences rather than materials, studies and the so-called job/trade. The new experiences for organizations are communication, power and construction/manufacturing or materials/processes. They list methods of instruction such as research and planning, line production, historical studies, group methods and methods for development of individual leadership. All these are listed as part of somebody's program somewhere.

I think a good example to start with is the Brady School in Cleveland. Their program starts in the seventh grade with nothing for the sixth grade. The sixth grade, however, is a part of the middle school. It starts out with a study of technology and is followed by a study of lab work in five major processes. The eighth-grade program in this school consists of nine weeks of mass production and nine weeks of industrial design. Probably the best-known middle school is Fox Lane in Bedford, New York. Fox Lane has taken the unified arts approach – industrial arts, home economics and fine arts. Each gives and receives from the total plan. The important thing I think we need to remember when we're talking about Fox Lane is, first, that deep daily planning is available, two hours a day in fact, and that deep pre-planning took place, in fact about four years' worth. The staff assigned to Fox Lane was well aware of the move one year previous to the time the school opened. They used 300 students in a work situation to assist in developing a program prior to the school opening (one month). Now, gentlemen, that is a lot of planning. If that type of program is going to go, it needs planning. Dury Fox, who is here as a representative from Washington, is well-informed about the Fox Lane School; they have had several telephone conferences and have visited. Renton is planning to install three unified arts programs. There are a few differences in their facilities. First, Renton will be on the ground floor, not the second floor and it just happens that the unified arts will be in the center of the total school complex. The idea of noisy activities and those needing ventilation have been planned for and lead to quieter activities.

It is very important that planning takes place in all schools. I hope it isn't as I hear so often, "What am I going to do for my school? My board met last night and said they were opening middle schools next year." Where is the pre-planning in this? No program under those circumstances is really going to work.

Let's go on from here to New York's early secondary industrial arts guide. It should and can affect a lot of programs in the New York area. The range of instruction is based on the theme of introduction to forces and materials. Two major blocks have been identified – Block One: woods, ceramics, plastics and drawing; and Block Two: electricity, graphic arts and power mechanics. Seventy-five percent of the time is actually spent in activity. Their program does, as far as I can interpret, rely heavily on hand tools for orientation. They also have another interesting program called Family Living in the Urban Society, an experimental program. Their guide is used and followed in this program.

Before we go on and give other examples, one of the focal points, already mentioned but the focal point of many schools, is the learning resource center. I think we in industrial arts may not fit in the main resource center and so should think about sub-resource centers in our buildings. We don't rely as heavily on textbooks as much as the humanities, etc., do, and we may want a center to utilize a single-concept film. Washington has recently obtained a Title III grant for previewing existing material for use in independent study as well as developing material that is not available. The idea is to set up two pilot schools, one for junior high 7-9, and one middle school, to open one year from now. The following year, two more will be opened with one located in the central city. They will be experimenting with independent study materials of all kinds, as well as redesigning the lab to fit the program. We hope to be able to report new directions next year.

Now let's review a few programs that are going on so we can see the wide range of differences. There are many. Orange Middle School in Pepper Pike Village near Cleveland based its program on a student-centered activity program where students determine specific work they will do within the curriculum framework, which is conceptual in nature. The courses, and I think this is very important, are not designed to be an introductory program for high school courses. They have taken the stand that many of their youngsters do not continue in the industrial arts area in senior high school; thus their program is not introductory, nor should its sole purpose be introductory. They acquaint seventh-grade pupils with units based on historical studies of technology, eighth grade with mass production and industrial design somewhat patterned after Dr. Maley's indoctrination. All instruction allows students to progress at their own rates and minimizes the importance of tool skills as a means of evaluation. I will make another reference to this later. Burlington, Iowa, reports its middle school will offer a program based on hand-tool orientation. This program, just under development, has not been evaluated. Eagle Grove, Iowa, Community Middle School has introductory industrial arts, no evaluation and little reported. Gary, Indiana, reports offering in their middle school program: visual communication, construction, manufacturing power, transportation. All students are exposed by assignment someplace in the sixth, seventh and eighth grades. One thread running through many reports is that most students are required to take industrial arts, and this has not always been true in the past. It was reported from Colorado that one of the major reasons Denver was said to have lost a major bond levy was middle schools. The people voted the levy down because of this. Nothing else has been reported from that area.

At our convention last year, the coordinator of industrial arts from Madison, Wisconsin, reported a program referred to as "related arts," a program under operation since 1963. In an interdisciplinary approach like unified arts, art, home ec., and industrial arts, last year, art was removed from the program, and in its place they are considering putting business education. They feel that these areas are most compatible. It may be one to watch for development and the direction it can give. Montgomery County, Maryland, reports two middle schools opening last September. They see the content much like the old junior high school and elementary programs combined, with two big differences, that is, home economics, art and music are taught daily and scheduled for a given number of periods a week for all students. Both programs seem to be in the extensions downward of what existed previously. It was also supplemented with the home craft idea. Hammond, Indiana, has not come to any valid conclusions in their program. Theirs is two years old, consisting of three labs – graphic arts/drawing, power metals, and wood/electricity.

Florida, as I think you are well aware, seems to have taken the middle school idea more to heart than any state. It goes all the way from the tool-skill idea at Naples to the two new schools in Broward County about which I read in the Miami Herald of last August. I now understand Broward County has (or will have this fall) about twenty, so the idea is growing rapidly there.

Naples' program is an extension of the academic, with the instructor acting as a resource person and consultant. Broad experiences are based on power tools, graphic communication, work bench areas and basic electronics and wood finishing. The tool skill area is located between art on one side and home economics on the other.

Pinellas County, Florida, is developing another program in similar areas: (as reported to me) woods, electronics, metal drawing, graphics, transportation, power and industrial craft. This is an open lab without walls or separations. Each area is taught with the industrial approach. They can see more than one teacher in this facility. As Ralph mentioned, the interim bulletin on industrial arts from the State of Florida is good, and most of you, if you don't have one, should write for a copy. It is an excellent guide, both for philosophy and middle school.

William Cuff, in the NASSP Bulletin, 1967, reported 18 states not reporting middle schools. He also reported in this same article that there were nine states reporting more than 15 middle schools each. The main problem he reported was that seventh- and eighth-grade schools were reported as being the middle school and may not really be so. This I don't think makes the figures very accurate. All reports received by me indicated that New York, Florida, Connecticut, New Jersey, Ohio and Michigan are all showing very rapid growth in the middle school. Pennsylvania reports new aims and goals for middle schools, which is an interesting guideline from this area. Philadelphia reports moving to a 4-4-4 system; and Massachusetts reported programs rapidly taking root there; Minnesota, six middle schools on a trial basis here; Texas has reported middle schools previously (43) basically seventh- and eighth-grade schools, now report one district opening 43 middle schools next year.

What about staff preparation; is unified arts going to work with the staff available now? Now you see the grass fire. The reasons are not always sound, a lot of reports exaggerated and so forth, with two sides to every report. I don't think we need to deal with the why as much as what do we do with them. This is the real problem. Our (Washington) first two middle schools are interesting to note: The instructors were given a year to plan but couldn't come to any kind of decision and actually just moved down the kind of program they had. It was also interesting to note what the community tried to do to those two middle schools before the first year of operation was over. ("Where is our interscholastic football team?") You need to know, however, that the same reasons listed for junior high schools are now the arguments listed for middle schools. We have to guard against these things if we are going to do the job that must be done for kids at this age.

We have a problem in Washington that other states may also have. We have identified for new buildings a per-square-foot support level, 75 square feet for each youngster in the K-8; 90 square feet for the 9th grade; 110 square feet for 10-12. All right, if you start a middle school and you lose the ninth grade, you've lost a lot of footage. Maybe it is reasons like this that make for reports indicating that there will be less square footage available for programs in middle schools. It is this kind of thing we have to guard against. Also reported is that less money will be available for equipment, and many people think they are going to save money. There are also problems of evaluation. Many teachers are still required to grade youngsters, and when they do they base their evaluation on skill ability. What they really grade is maturation. One of the newer programs offered in many middle schools is typing. It is supposed to be personal typing, but the first thing it becomes is speed typing. A lot of people in business education are very concerned about this skill level requirement and what it does to kids' attitudes. They should be, because it is turning kids off. The kids that fail now do not enroll in high school. Their high school enrollments are down. PE is another area that is very concerned with maturation. PE teachers are requiring kids to do things they used to require when they were a year older, and the kids aren't advanced enough to do it. Yet they are evaluating on this basis. If I had any one criticism to make after visits throughout my state, it would be the skill evaluation we as teachers use and what this can do to future programs.

So one of the greatest problems I think facing the continuation of middle schools is going to be a close reliance on teacher education. In other words, human development evolved through child psychology applied to the activities these youngsters are compelled to do. Right now I don't think they are. In this area we have to be very careful. In closing, a few major questions we need to answer as a group are: What directions are we going to give this grass fire (you might call it the land rush)? Where are we going to get teachers for our programs? And who are they going to be? Now let me just remind you when you get home, you just may have two new middle schools to guide and direct.

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A correlated elementary industrial arts curriculum

William R. Hoots, Jr.

Many people have recommended that elementary school industrial arts be directly related to other areas of the curriculum. The implementation of this basic idea has taken several directions ranging from a complete integration of industrial arts subject matter with other curriculum areas to that of using industrial arts as a method of teaching other subjects or to a separate but correlated approach to teaching industrial arts.

Several basic assumptions should be stated before going into any further discussion of this subject. I maintain that the following are essential to identifying and conducting a program of industrial arts education: (1) Industrial arts is a subject matter discipline having a body of knowledge distinct and unique in its own value; (2) industrial arts is the study of industrial technology; (3) industrial arts is taught by an activity-centered or manipulative method; (4) instruction in industrial arts should begin at the beginning of formal education, kindergarten or grade one; and (5) there is a close relationship between industrial arts and other areas of the elementary school curriculum.

The following outline is the basis of an industrial arts curriculum for grades one through eight that was developed in a study in which it was further assumed that elementary school textbooks contain references to industrial technology sufficient and appropriate to the development of an industrial arts curriculum correlated through these references with the remainder of the curriculum.

A grant from the US Office of Education made it possible to conduct a study in which all basal elementary school textbooks for the North Carolina public schools were examined for references to industrial technology. Each book was examined carefully, page by page, and all such references were catalogued according to the following five classifications: manufacturing, construction, communications, power and transportation. These were further organized into an outline which provided an organized overview of references to industrial technology contained in the elementary textbooks.

Comprehensive outlines for grades one through eight were compared and studied for duplication of information in adjacent grades and for completeness of content. It was determined that a very comprehensive and complete outline was derived by this method, but there were numerous incidents of repetition. The outline was revised by eliminating repetition on the basis of the frequency of reference for certain items and the appropriateness for the study of that item in a particular grade. The following is the outline that was developed:

Grade I

- I. Transportation
    - A. Land: Truck, Auto, Bus, Train
    - B. Air: Airplane
- II. Manufacturing
    - A. Saws: Crosscut, Coping, Back
    - B. Hammers
    - C. Painting
- III. Service: Automobile, Carwash, Street Cleaning, Mail

Grade II

- I. Communication: Telephone
- II. Construction
    - A. Houses: Materials
- III. Power: Air, Steam, Wind
- IV. Service: Milkman, Snowplow, Fire Fighter

Grade III

- I. Manufacturing: Iron, Glass, Paper, Clay, Food, Textiles
- II. Power: Simple Machines, Electricity
- III. Transportation
    - A. Land: Truck, Trains
    - B. Air: Airplanes, Helicopter, Rockets
    - C. Water: Ocean-going ships

Grade IV

- I. Power: Wind, Animal, Water, Steam, Gasoline, Electricity, Rocket, Atomic
- II. Transportation
    - A. Land: Rolling (Wheel, Friction, Bearings), Sled, Bicycle, Train, Auto, Bus, Truck
    - B. Air: Airplane, Helicopter, Rocket
    - C. Water: Boats, Ships, Submarines
- III. Construction: Houses of different lands

Grade V

- I. Construction: Materials, Railroad, Roads, Water-related (Canal, Harbor, Locks, Dams, Fish Ladder, Bridge)
- II. Manufacturing: Food Products, Wood Products, Textiles
- III. Power
    - A. Hydroelectric: Production, Use
    - B. Electric

Grade VI

- I. Communication
  - A. Writing
  - B. Electronic: Radio, Television
  - C. Electrical: Telegraph, Telephone
- II. Construction: Houses, Bridges, Roads
- III. Manufacturing: Metals, Glass, Clay, Chemicals, Petroleum, Coal
- IV. Power: Gasoline, Diesel, Rocket, Jet, Turbine
- V. Service: Water System

Grade VII

- I. Communication: Newspaper, Photography
- II. Construction: Houses, Bridges, Roads
- III. Manufacturing: Metals, Wood Products, Tobacco

Grade VIII

- I. Manufacturing: Wood Products, Food Products, Textiles
- II. Power: Animal, Wind, Water, Electric, Atomic, Petroleum, Coal
- III. Transportation: Land, Air, Water

No effort was made to determine how this curriculum might be implemented, but it should lend itself to either a correlated, integrated, or separate subject approach. The implementation would depend upon the teacher, facilities and other conditions dictated by the individual situation. However, this curriculum can serve as a guide to the development of a comprehensive industrial arts program for grades one through eight.

Textbook references to those books on the North Carolina basal list are available and facilitate correlation. However, this is not essential to the implementation of this curriculum. The idea that references to industrial technology are in the textbooks, that they can be organized and correlated in a program of elementary school industrial arts, and that they should be emphasized in the elementary school curriculum is of primary importance. If the children in America's schools are to receive instructions about their technological environment, a curriculum such as this is essential to that education.

Dr. Hoots is on the faculty at East Carolina University, Greenville, North Carolina.

A study of the man-made world for elementary schools

A. Dean Hauenstein

This report will review the development of a new and broadly-conceived industrial arts program for grades K-6. The curriculum was developed during an NDEA Institute for Advanced Study, held at The Ohio State University in the summer of 1968. Elementary teachers, principals, supervisors, specialists and teacher educators from all parts of the nation contributed to its development. The writer served as the Industrial Arts Curriculum Project's adjunct professor for the institute and provided the participants with the IACP rationale, structure and process of curriculum and instructional systems development.

Objective. A major objective of the institute was to develop a curriculum and instructional scheme to help American youth understand how industry produces the man-made world.

What do you do to make the study of industry more realistic and relevant to children? Since the custom-production activities of the "cottage industries" era do not reflect modern industry, what should we teach? Should we continue to focus on materials, processes, tools and techniques as they relate to products? How can we teach the broad spectrum of industry, rather than selected projects? How can we make the study of industry a "solid" subject rather than a supporting activity for other subjects? These and other perplexing problems were analyzed and synthesized, and solutions were proposed.

Defining a body of knowledge. To improve elementary school industrial arts first required a definitive statement about industry. Basic terminology delineated by the rationale of the IACP was adopted. For example, industry is defined as "that sub-element of the economic institution which substantially changes the form of materials to satisfy human wants for goods." The two gross systems for producing material changes are specified as construction (on-site) and manufacturing (in-plant). These two systems for effecting changes in the forms of materials provide the content for the curriculum. Bakeries, printing establishments, canneries, meat packers, textile mills, road building, bridge building, landscaping, oil refineries, sewage plants and chemical producers are included as examples of construction and manufacturing which substantially change the form of materials to satisfy human wants for goods.

Activities such as marketing, transportation and communication do not substantially change the form of materials and therefore fall outside the body of knowledge to be studied. However, the products and structures used by these services fall within the domain of industry as defined. It was determined that the teaching of communication and transportation, for example, really focused on the products and structures used by these services rather than on the business of operating airlines, bus lines, railroads, telephone and telegraph companies. Therefore, it was appropriate to include products and structures used in service activities.

How can all of this and more be taught? It was determined that to focus on the products, materials or kinds of industries was of lesser importance and value than to focus on the total process by which material form is changed into goods to satisfy society's wants for goods. Wasn't there a "common process" applicable to all manufacture and all construction?

The "common process" generated by the IACP, for the production of any manufactured product and any constructed project, was analyzed and synthesized. The stages of the process, as well as the steps within the stages, are arranged sequentially into a managed-production system for producing goods. It is also called the "input process output" system. Collectively these stages provide a "story" of changing the forms of materials. Therefore, the "story of manufacturing" and the "story of construction" were used as the framework model for deriving content. The stages of the synthesized common process are shown in Table 1.

CONSTRUCTION	MANUFACTURING
Beginning the Project	Identifying Consumer Demand
Selecting a Site	Designing and Engineering the Product
Designing and Engineering the Project	Planning Production Processes
Contracting	Tooling Up for Production
Supplying and Scheduling for Production	Securing Inputs to the System
Preparing the Site	Establishing Production and Quality Controls
Setting Foundations	Preparing Raw Materials
Building the Superstructure	Making Industrial Materials
Installing Utilities	Making Components or Finished Products
Finishing the Structure	Combining Components
Completing the Site	Assembling
Transferring the Project	Preparing for Distribution
Servicing the Constructed Project	Servicing Manufactured Products

Each stage is further delineated by a core of common practices and alternatives. Table 2 is a sample delineation of one stage: making components or finished products. In manufacturing, components are only made by forming and/or separating.

A defined, delineated and structured body of knowledge has the context and continuity for generating learning experiences in which the parts total the whole. It has the potential for conveying the essence of "what is done" in each stage and the alternatives of "how it is done."

ALTERNATIVE PRACTICE	HOW IT IS DONE
Material Forming	Casting or molding Compressing or stretching Conditioning
Material Separating	Shearing Chip removing Separating by other processes

Developing the instructional system. Preferably, the time spent gaining knowledge of the man-made world should at least equal the time spent gaining knowledge of the natural world. However, it was decided that one hour per week (36 hours per year) of instruction in manufacturing and construction could well replace the present industrial arts and crafts curriculum. It was also decided that one major concept should be presented each instructional period. Therefore, the curriculum would include 36 major concepts in construction and 36 major concepts in manufacturing. Starting with the common process framework of the managed-production system (13 concepts each industry) the balance of 23 concepts had to be selected for each industry. Each managed-production stage was studied for "what is done" and "how is it done," and subconcepts were identified and selected. For example, in construction, Preparing the Site can be expanded into at least three basic subconcepts: Clearing, locating the structure, and earthmoving. Clearing, for example, can be further delineated into: reducing obstacles, demolishing or salvaging, and disposal or stockpiling.

After the 36 concepts were selected for both construction and manufacturing, the next step was to develop behavioral objectives for each concept. Questions like, "What would the student be able to do at the end of learning experiences that he couldn't do before the hour?" were examined and answered. Behavioral outcomes or evidence of learning were specified. The following are examples.

> (Manufacturing K-2, Making Components or Finished Products)
> "As a result of their learning experiences, the students should be able to make the parts of a toy boat using wood as a basic material; use and identify six common hand tools; and describe how the form of the material was changed."
>
> (Construction 3-4, Setting Foundations, subconcept--Working with Concrete)
> "As a result of their learning experiences, the students should be able to mix the correct proportions of water, sand, cement and aggregate; place the mixture in a form; and float-finish the concrete with a wood trowel."
>
> (Manufacturing 5-6, Designing and Engineering the Product)
> "As a result of their learning experiences, the students should be able to decide upon a preliminary design of a periscope; determine through experimentation the location of the mirrors; and sketch and dimension a periscope."

All activities (72 for each grade level) were designed and engineered to bring about specific behavioral outcomes representative of the major concept.

The same set of 36 concepts for manufacturing and 36 for construction was used for each grade level. The learning activities and behavioral objectives were varied to correspond with the learners' age groups, interest areas and ability levels. A single page was written for each hour of instruction, presenting the concept, a definition, a behavioral objective, a description of the activity, which is representative of the common practices of industry, a teacher presentation, a list of supplies and equipment, a reference, and suggested areas of correlation with social studies. The pages were duplicated and compiled in the sequence of the "common process" to form teaching guides for grades K-2, 3-4 and 5-6.

Problems of implementation. The major obstacle in implementing a structured curriculum in the elementary schools was the notion, "If the subject matter isn't correlated with social studies, it probably won't be taught." To reject or fragment a "whole" educational entity because it does not mesh with social studies textbooks is questionable educational practice.

It was felt that the learning and understanding of the construction and manufacturing "stories" would be most meaningful if the sequential concepts and representative activities were taught "in context" rather than fragmenting the sequence and teaching them "out of context." Continuity increases the meaning of experiences; whereas fragmentation and "out-of-context" learning results in decreased understanding and in irrelevance. The objective was to help youth become knowledgeable about the man-made world: How industry changes the forms of materials, in construction and manufacturing, to satisfy society's wants for goods. The role of elementary industrial arts is to change concepts of the man-made world into relevant learning experiences which realistically reflect industry and thus increase the student's understanding of his world.

The institute was an initial attempt to produce a "whole" curriculum for elementary industrial arts. At the end of the institute it was suggested that participants test and evaluate the program in their schools. It is hoped that other elementary teachers and curriculum supervisors also will consider establishing and operating this or a similar curriculum in their schools and that they will communicate with the writer concerning any such instructional program. Such efforts should generate many new ideas for improving elementary industrial arts.

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The utilization of single-concept films to teach multiple activities in industrial arts

Donavan L. Jones

What is a single-concept film? Elwood Miller's article, "Single-Concept Films: Criteria for Clipping," in the January, 1967, issue of Audio-visual Instruction, gave the following definition of a single-concept film: "a segment of a film with short, discrete, describable instructional content". I would say that a single-concept film is an instructional device which presents and reinforces one or two major concepts or ideas in a clear, concise and logical manner. I feel that the above definition fully describes the purpose of a single-concept film.

Now that we have a definition, let us look at the advantages and disadvantages of the single-concept film as a teaching device in the industrial arts laboratory. We will first discuss the advantages as pointed out by Frank Withrow in his article, "Status of 8mm Motion Pictures in the Classroom," in the November, 1966, issue of The Volta Review. The advantages are as follows: (1) "Controlled presentation of material." You as the teacher can present the material in the manner, order and with the machines the students will be using. This is a real advantage for the student, because all controls and so on are exactly the same as the student will be using. When you use a commercial film, it probably will be showing a different model or different brand of machine, which is not good for student self-instruction, because the student might be operating a different brand and model of machine. (2) "Instantaneous availability." This is important because the film can be used at the exact time the student or students need this information, whereas a 16mm film in most situations is not available when needed. How instantaneous is the single-concept film? It is as quick as selecting the film desired, inserting the cartridge into the projector and turning on the switch. (3) "Increased exposure." I interpret this to mean that the student can replay the film time and time again until he grasps the concept. Also two days later the student can view the film to refresh his memory, or he can go out into the shop and start setting up. If the student forgets what step comes next, he can go back and watch the film again. (4) "Positive emotional reinforcement." The student is able to watch the film then proceed to the job and complete the job with satisfactory results, which will give the student more confidence. This can be emphasized by a personal-experience example: Two low-ability students started on foundry in a multiple-activity situation. The foundry was the first area we filmed. The actual foundry demonstration had been given five months prior, so you can see the students would need review and help. Normally I had to stand over this caliber of student until he had rammed up the first mold. This time I had the two students use the films without any help from me. The two students ended up watching the films four times and then rammed up a perfect mold and poured a perfect casting. I also found that they did better in other phases of classwork and in a woodworking class which I taught. (5) "Self-instructional experiences" and (6) "Training towards independent study." I feel these two advantages can be combined in our situation. The single-concept films allow the students to progress at their own rate. The students do not have to keep up with the average pace set by the instructor, as happens in the traditional lecture-demonstration-type course. Now the demonstration is available to the student when he needs it, whether it is this week or next month.

The single-concept film used in conjunction with the contract teaching approach helps facilitate independent study in a multiple-activity class. I am using the contract method in conjunction with the films and find the students are progressing faster than the groups I teach traditionally with the use of the films. I have five groups or classes with three classes on contracts and films, and two groups on lectures, demonstrations and films. The three groups who are on independent study have advanced faster and have a more thorough knowledge than the traditional groups.

Now let us take a look at a typical class period in a multiple-activity class. The five activities are: sheet metal, foundry, bench metal, engine lathe turning, and welding. You can see there is a varying range of activities. Every four weeks the students rotate to a new area of activity, and the first couple of days are a rat-race for me, because the material on each area has been covered previously, one month ago or more. The students have forgotten most of the pertinent information because there was not immediate reinforcement. So the students are saying in each area, "Mr. Jones, why doesn't it run? What is the next step? How is it done?" and so on.

What is the answer to this teacher nightmare? As I see it there are three possible answers: (1) Try to answer every student's question; (2) send the student to look up the answers in some form of written material; or (3) send the student to watch the actual demonstration which is presented on a single-concept film. Now that the students are oriented, they do not ask but immediately go find the answer by watching a single-concept film on their particular subject. As a teacher I am available to help the students with problems which cannot be put on film. I get a chance to talk and help with each and every student every single day or class period, which allows me to keep a closer check on student progress. This is a real advantage for both student and teacher.

Next we will discuss the disadvantages. There are only two as I see them, and they are: (1) The brevity of the films, which last a maximum of four minutes, and (2) the lack of audio. Even these disadvantages can be alleviated somewhat, because it is possible to obtain audio with a correlated single-concept projector and cartridge tape which allows the instructor to add audio to the film. The film can then be lengthened to between 15 and 20 minutes. This can be accomplished by an electronic signal which stops the film on the desired frame while the audio explains that segment of the operation.

Even with the two previously-mentioned limitations, I feel the advantages by far outweigh the disadvantages. To emphasize this I will relate to you the conclusion of a study which was published in the December, 1967, issue of the Research Quarterly, titled, "Effect of Daylight Projection of Film Loops on Learning Badminton," by Wayne Brumbach and Charles Gary. Their conclusion was that the two experimental groups using the film loops appeared to learn faster. This conclusion was also supported by the results of an opinionnaire which the authors gave to the experimental groups.

In conclusion I would like to re-emphasize the advantages, which are: (1) Teacher-controlled presentation, (2) immediate availability, (3) immediate reinforcement, (4) repetitive replay, (5) student independence and (6) more teacher time for individual student help. These advantages and personal experience leave no doubt in my mind that the single concept films should be utilized by all industrial arts teachers whether in a multiple-activity situation or not. About the only real limitation to their utilization is the individual teacher's imagination.

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Designing facilities for the teaching of multiple activities

Ronald Zielke

A farmer was walking through his fields one day and happened to find a one-gallon jug in his pumpkin field. With nothing better to do, and finding himself in an experimental frame of mind, he poked a vine with a small pumpkin on it through the neck of the jug, taking care not to break the vine and left it. Finally, when it came time to harvest the pumpkins, the farmer again came across the glass jug. The pumpkin had filled the jug completely and with no more room to grow, had stopped growing.

Are we as industrial arts instructors like this farmer? Are we placing jugs, or rooms, in our departments that will allow our students to grow and develop to their fullest potential, or will they be stunted by our facility's physical handicaps?

Responsibility for the best possible design of our industrial arts facilities and curriculum is not only the problem of our school architects and administration. This is also our problem; your problem and mine!

It is our responsibility to interpret the needs to our school administrators, school boards, citizen planning committees, and architect to provide for the best possible facilities available to fit our needs. The organization of any industrial arts facility is influenced directly by the type of instruction used and by the objectives of the total program.

I feel the area of industrial arts should be taught on a multiple-activity basis, and, where possible, in a facility designed with that in mind. I would like for you to consider with me some of the early decisions that need to be made, a skeletal anatomy of a facility designed for the teaching of multiple activities and a suggested curriculum.

What would you do if your superintendent or building principal walked into your office and said, "Bill, the school board has just given its consent to look into the possibilities of expanding your shop area or maybe even building a totally new complex. Could you meet with an industrial arts committee made up of citizens from the community on Monday night and give them some considerations to keep in mind while they help you plan a new industrial arts area for us?"

Well, if you are like the rest of us you would probably say, "Why I sure will," trying not to make it sound like you are too overjoyed. But then after he has gone you begin to think through what he asked and what he was really asking of you – especially now, when there were projects that had to be graded and grade cards due in a few days, not to mention the blades that have to go back in the jointer, the re-order on wood that disappeared faster than you had planned and those cupboards you were building at home in your spare time.

What should be thought of before making recommendations on a new facility? Oh, there are a lot of things that race through your mind in a hurry, like that new radial arm saw the salesman told you about the other day, more storage area for those high school projects, and maybe now you can add that course in electronics that you have been thinking about. But this is the hit-or-miss approach of adding to or developing our industrial arts program which has been used too much in the past.

The selection of our industrial arts programs and facilities should be influenced by many factors other than money, which so often has been the case. A few of these factors are: Community interests, existing and potential enrollment, current trends in general education and changes occurring in our own subject area itself.

This brings us face to face with the first decision we have in starting to design an industrial arts facility: Our own individual philosophy of industrial arts. This will be the overriding regulator in all decisions of facility design. If we see industrial arts as a preparation for employment or as a place to develop salable skills utilizing six or seven of the materials or forces used in industry today, then really there is no need to implement any change. Most of us are doing this today. But if we really see only one goal – that of providing a general overall awareness and understanding of American industry and its changing technology to all students – then we need, when the opportunity arises, to develop facilities that provide for this; and here I feel a facility utilizing multiple activities, where machines, tools and materials are the means to an understanding rather than the content, is the answer. Most of our present general shop situations could be adapted to this approach with little physical alteration except maybe a change of emphasis from the materials used in industry to the functions of industry.

The technological advances that have taken place in our country the past few years have had a forceful impact on general education, including the area of industrial arts. This impact has prompted a re-evaluation of the industrial arts objectives that should be emphasized in our programs. Our objectives for today's Space Age are now aimed at the students':

(1) Increasing awareness to the many occupational opportunities available;
(2) Development of safety attitudes towards materials, tools and working habits;
(3) Understanding of interrelationships of different occupational areas;
(4) Exploration of individual talents with respect to future occupational goals; and
(5) Understanding and application of the disciplines involved in problem-solving activities and research.

A facility designed anew or a rearrangement of our present facilities on a multiple-activity concept of organization and instruction, I feel, can best meet these objectives.

Thinking of these objectives and facing the same situations that Bill had to, that of meeting with and making recommendations to a citizens' industrial education committee, the staff of Hesston High School, along with the help of Ed Webb, chairman of the Industrial Arts Department, Wichita State University; and Alvin Rudisill, head of the Industrial Arts Department, University of North Dakota; developed the following plans of a facility that will utilize the multiple-activities approach.

It was decided that to better facilitate total supervision on the part of the instructors, allow for versatility in shop arrangement and eliminate duplication in equipment, we would set aside the old rule of thumb that an industrial arts shop had to be one and one-half times its width in length. So we suggested an open-space octagon-shaped building. This was later changed to a hexagon by the architects to fit into the aesthetic aspect of the total complex.

Into this hexagon shape we then tried to fit the areas in which we felt our students should obtain exploratory experiences. This involved a certain amount of grouping and renaming of general areas. Basically our industrial experience areas were divided into three main divisions: Material technology, which includes wood, metal and synthetics; power technology, approaching power as a prime mover, including electricity/electronics; and graphic communication, incorporating printing, drafting and photography.

The size of the industrial arts pod measures 98 feet across flats and 113 feet corner to corner and consists of approximately 8,400 square feet. Trying to keep in mind projected student growth, maximum class sizes of twenty students, a future move to modular scheduling, noise and dust factors, equipment space requirements and the method of teaching industrial arts from a multiple-activity approach, the hexagon pod was subdivided in the following manner.

The material technology laboratory, covering the experience area of wood, metal and synthetics, accounted for the largest portion of the total pod, approximately 3,500 square feet. This also included the enclosed areas of the finish room, hot metals, dust-controlled machines and material and project storage.

Adjoining this area of material technology and with no physical divisions between, is the 1,780-square-foot power technology laboratory. Consequently, this allows an open lab over 3/4 of the pod.

Although the rest of the pod is physically partitioned off due to interference from noise and dirt, accessibility to and the movement throughout all areas are stressed.

The graphic communication laboratory joins the open lab and consists of 1,012 square feet, including the enclosed areas of darkroom and storage.

The remainder of the area was set aside for large- and small-group instruction, offices and independent study.

With emphasis placed on individual study, the independent study area was added and will be equipped with resource materials including audio-visual single-concept materials that can be viewed at individual study carrels.

The building has all-artificial light, is climate-controlled throughout to facilitate operation year-'round, and all services are dropped from the ceiling to promote versatility within the major areas. Basically it is designed for three instructors with a total student load of sixty, plus ten independent study students any given period of instruction.

Since we considered our program of industrial arts a part of the general education, we also preferred to be part of the total complex. With the increased availability of sound deadening materials, industrial arts facilities today can be part of the main building.

Even with logical orientation with respect to the total complex, we need not be physically stuck off behind every other building any more, on the school site. In fact a distinct advantage can sometimes be gained by locating the industrial arts facility in the education complex. Hallways and restroom facilities, if located close to the industrial arts lab, can allow more usable space in the industrial lab itself, which was the case in our situation.

Designing a facility for the teaching of multiple activities has one very distinct advantage especially when we start to think in terms of equipment needed and costs involved. Keeping in mind again the philosophy and the objectives of a facility utilizing multiple activities, we realize that we do not need a machine shop with twenty metal lathes, a drafting room with twenty desks and drafting machines, or a welding area with twenty welding stations. We can probably get along with one and possibly two at the most in any area. As an example, we might have a class of twenty in the area of material technology; this means approximately six or seven students working somewhere in each area of wood, metal and synthetics. Consequently the money saved on equipment duplication can be used to purchase equipment that will provide additional new experiences for the students.

I realize the problem of planning student involvement in a facility designed for the multiple-activities approach is hampered when the only experience we as teachers can call on comes from past participation in facilities established for the teaching of skills which now are taken over by our vocational and technical schools. But it is further compounded when we assume our responsibility and try to sell this approach to the community, administration and architects who are also bringing their early experiences into play, experiences some of which originated in the era of "manual training."

This brings us face to face with the one area that is constantly trying to emerge and must emerge all through the planning stages of any industrial arts facility – that of curriculum. A brief curriculum outline which could be used in a facility designed for multiple activities might be like the following, set up for Hesston High School.

Our industrial arts curriculum program spans the grades seven through twelve. Even though the facility we have planned is basically for high school students, the curriculum in the 7th and 8th grades is pertinent here to maintain a correlation between the junior and senior high.

Curriculum Content--Junior High

Seventh grade--one hour daily.

General understanding of industry covering the following areas:

(1) Graphic communications
    a. Drafting
    b. Graphic arts
(2) Industrial organization and production
    a. Mass production
    b. Group study of particular industry

Eighth grade--one hour daily.	Suggested approximate time spent
(1) Introduction	3 weeks
a. Requirements for all areas	
b. Industrial applications	
c. Career applications	
(2) Materials technology	
a. Woods	6 weeks
b. Metals	6 weeks
c. Synthetics (Plastics)	6 weeks
(3) Power Technology	
a. Power mechanics	6 weeks
b. Electricity - Electronics	6 weeks
(4) Completion and evaluation	3 weeks

Curriculum Content--Senior High

Ninth grade--one hour daily.	
(1) Introduction and review	3 weeks
(2) Graphic Communications	10 weeks
a. Drafting	
b. Graphic Arts	

(3) Material Technology — 10 weeks
  a. Wood
  b. Metal
  c. Synthetics (plastics)
(4) Power Technology — 10 weeks
  a. Power Mechanics
  b. Electricity-Electronics
(5) Completion and evaluation — 3 weeks

Tenth grade--one hour daily.
(1) Individual Study and Research I.
Student has choice of one or more of the major areas that will be contracted with the instructor and explored at student's own individual speed coupled with weekly student-teacher conferences evaluating depth and breadth of study.

Eleventh grade--one hour daily.
(1) Individual Study and Research II.
Same as tenth grade.

Twelfth grade--one hour daily.
(1) Individual Study and Research III.
Same as tenth grade.

Student participation in grades 7-9 will be on a multiple-activity basis, divided according to the areas offered. If, in the event a student upon completion of grade nine decides he is interested in pursuing one of the particular areas as a vocation, he is then, with the help of the industrial arts instructor and the school's counseling service, allowed to investigate one of the surrounding vocational schools. However, we do not recommend that the student make an occupational choice during high school. If the student elects to remain in high school and later attend a post-high vocational school or college, he is allowed to concentrate on a special interest area, preferably more than one each year through grades 10 to 12, on an individual contract basis with the instructor. Independent study under the contract system for the student will center basically around the four areas of objectives, laboratory activities, readings and evaluation.

The total instructional program at all grade levels, I feel, should be highly-structured with expanded use of instruction sheets, audiovisuals, manuals and reference books, to help develop students' responsibility in some part for their own achievements.

This curriculum and facility design, I am sure, is not the utopia for teaching multiple activities, but I feel it will help to place the study of industry and its expanding role in our lives as a part of Hesston's general educational program.

The next time you are given the opportunity to get involved in a curriculum revision or a building program in your area, jump at the chance. First review the latest reference material available on facility planning, a lot of which appears in the annual shop planning issues of Industrial Arts and Vocational Education and School Shop magazines; then evaluate your own philosophy of industrial arts; obtain the figures of potential growth; design a facility for the teaching of multiple activities; and sell your program to the administration and community. The best-qualified people in education today to foresee and plan for the industrial understandings of our students are you as industrial arts instructors.

When you go back to your industrial arts departments this next week and prepare again to take charge of the best potential future leaders we have ever had in this country, think twice before you poke them into a jug that will limit their growth to skills which will possibly be outdated before they leave school.

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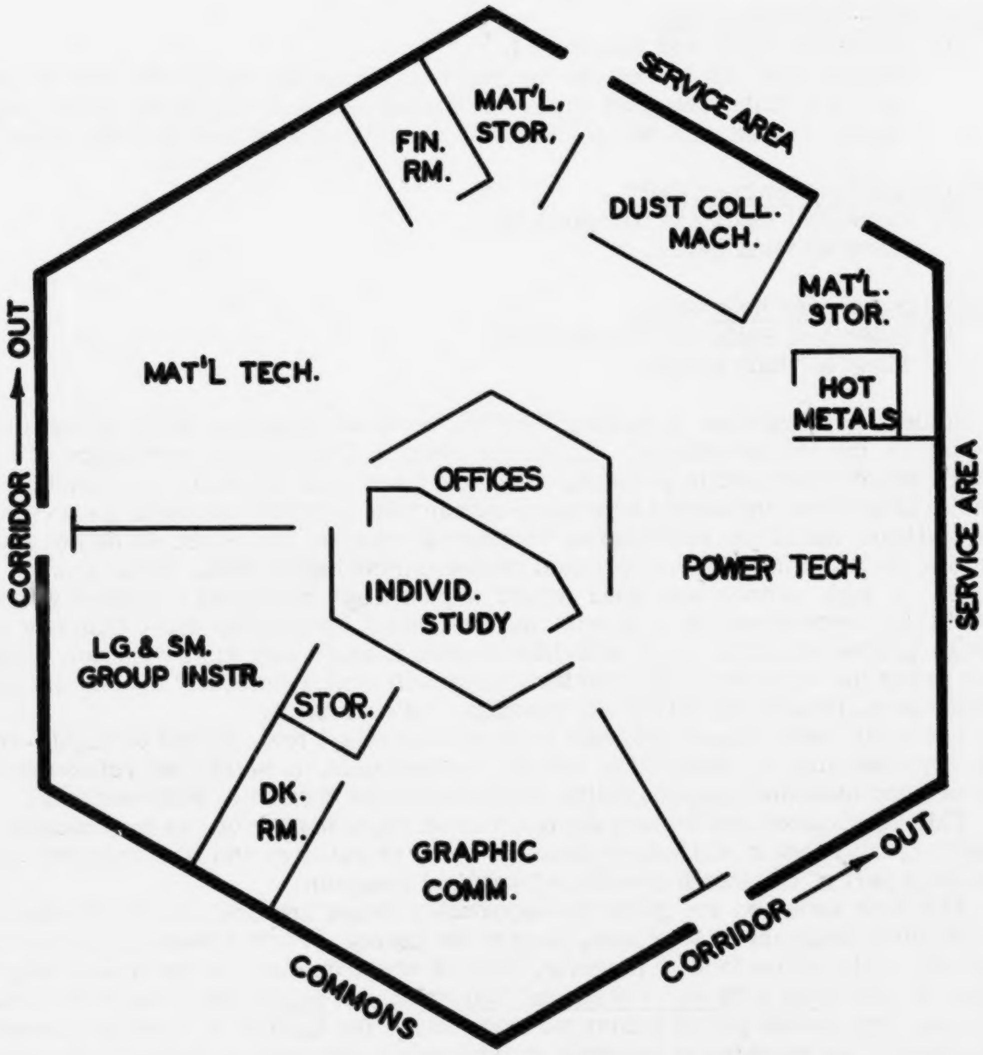
SERVICE AREA
MAT'L. STOR.
FIN. RM.
DUST COLL. MACH.
MAT'L. STOR.
HOT METALS
MAT'L TECH.
CORRIDOR ——→ OUT
OFFICES
INDIVID. STUDY
POWER TECH.
SERVICE AREA
LG.& SM. GROUP INSTR.
STOR.
DK. RM.
GRAPHIC COMM.
CORRIDOR ——→ OUT
COMMONS

INDUSTRIAL ARTS POD
HESSTON HIGH SCHOOL

inner-city schools

Changing attitudes to teach culturally deprived youth

Alvin I. Thomas

There is a very strong possibility that when you were educated for your present position, little reference was made to the need for a teacher to "change his attitude" in order to teach students. In addition, there is an even greater possibility that you did not encounter the terminology "culturally deprived" as a part of your undergraduate or graduate studies.

Chances are that as prospective industrial arts teachers, you spent long hours laboring over a "definition for industrial arts." You favored definitions by Bonser or Anderson or Newkirk or Silvius. You probably had long struggles in what was purported to be great intellectual depth, considering the skills and knowledges of the T & I teacher versus those of the industrial arts teacher. In the area of curriculum, it was handcrafts as opposed to machine tools approach. Or, it was a curriculum to reflect the manufacture of products or a curriculum to reflect technology.

When we took that one course in educational psychology, we wondered, "Why waste the time?" — and we inevitably ended up doing a chart on the characteristics of an adolescent boy. In this chart we would outline all of the behavioral characteristics of that youth we were to find in the classroom.

Very orderly... very peacefully... industrial arts teachers were carefully prepared for the years ahead. Education for the fabulous fifties, they said... Education for the sensational sixties was heralded....

The technology moved forward, the socio-economic problems which Bonser spoke of in the first decade of this century also moved forward, and the industrial arts teacher found himself in a world which he neither expected nor understood, and for which he was unprepared.

A part of this world is the world of the "invisible poor" and the world of the "culturally deprived". Today in our inner-cities these two worlds slowly make up an increasing percentage of the school population. Industrial arts teachers who teach in schools in the inner-city find themselves with students who never associate "gum" and "poplar" as names of wood. The traditional tie rack has no appeal, value or worth to the culturally-deprived or invisible poor. A zip-gun, jimmy stick or box of tools does have value to the students, and its value may be beyond the knowledge and comprehension of the teacher.

It is in this realistic context that we consider the topic: "Changing the Attitude of the Industrial Arts Teachers to Meet the Needs of Culturally-Deprived Youth."

For the sake of clarity, let us move to define a few terms. We will not go into a long detailed definition of industrial arts teachers. This being a convention of such teachers, we will suppose that we understand the professional group which bears this designation.

What do we mean by "change"? Webster's New Collegiate Dictionary (1) defines change as: "to make different in some particular." This dictionary further states: "change implies making either an essential difference often amounting to a loss of original identity or a substitution of one thing for another." In addition, this dictionary points out that "to change" is different from "to alter." Alter implies a difference in some particular respect without breaking away from sameness.

This paper deals with "changing attitudes", not altering attitudes. It therefore stands that we will address ourselves to making attitudes essentially different, resulting in a complete loss in the old attitude. This type of behavior change on the part of the industrial arts teacher is the only meaningful position that can be accepted in terms of the seriousness of the problem.

What do we mean by "attitude"? English and English (2) gives the following definition: "Attitude is an enduring, learned pre-disposition to behave in a consistent way toward a given class of objects; a persistent mental and/or neural state of readiness to react to a certain object or class of objects, not as they are, but as they are conceived to be. It is by the consistency of response to a class of objects that an attitude is identified. The readiness state has a directive effect upon feeling and action related to the object."

Surely there are other definitions of attitudes, and you may have your own, but I am sure you will agree that the above definition is quite adequate for the purpose of this paper.

This now leaves us to define "culturally deprived". Depending upon one's attitude, a specific person might rush to brand certain minority groups or certain whites as culturally deprived.

There is no simple defintion for the "culturally deprived"; however, there are some definite characteristics which may assist in a definition. The culturally deprived constitute one-fourth of the nation's population. They may be any race: White, Negro, Latin American, Puerto Rican, Indian or other minority. Each person identified as "culturally deprived" can generally be identified by one or more of the following characteristics:

(1) Poverty: Undoubtedly, this is one of the major characteristics of the culturally deprived. Inevitably, they are financially poor. Today, there are more than 30 million Americans classified as poor, despite the low unemployment statistics for both white and Negro in the slum areas of the cities and the rural areas of the nation. Nearly one-quarter of the nation's families still have annual incomes of less than $3,000. Wetzel and Holland (3) recently reported that unemployment for workers living in poverty areas of big cities was 7.5 percent, about double the rate for the United States as a whole. For teenagers in the poverty areas, it was nearly 25 percent. In the big cities of America, more than half the Negroes who make up the population live in poverty, but only one-tenth of the whites live in poverty.

While poverty is not the only characteristic of the disadvantaged, it is one that is most outstanding. Students attending your classes who come from poverty also bring to your class the cultural disadvantages of this poverty.

(2) Disordered family: This is a distinct characteristic of most of the culturally disadvantaged—the absence of one parent or both parents or living with relatives or friends; the mother- or grandmother-oriented family; the instability of the male in the family unit; the common law marriage condition; the multiple-father situation, in which children have different fathers whom they may or may not know or may not have ever seen.

(3) Lack of motivation for learning: Coming from homes and environment where education has little meaning or value, the culturally deprived usually have little yen for learning. The parents or parent usually have not completed elementary or high school. Poverty has removed books, newspapers, records, maps, globes, tools, materials and practically all other aspects of formal learning from the home environment. There is learning in the environment, but it's learning for survival. Every child from the disadvantaged group learns this lesson and learns it rapidly.

Since the disadvantaged youth grows up in a people-centered environment, his sensitivity to school with its abstract ideas and, to him, pretense of reality is extremely hard to grasp. The life of the culturally-disadvantaged is real from the minute he is born. His parents and friends are not school-oriented. His activities are not school-oriented. There is very little that the disadvantaged youth can see that would indicate that education, industrial arts or school is worthwhile to him.

(4) A different culture: In a sense, the culturally-disadvantaged may be classified as a foreign student. Many teachers think of the culturally-disadvantaged as a cultural deviate. A statement by Charles Thomas (4) illustrates this point for the industrial arts teacher and all teachers in an eloquent manner:

"So many middle-class people can only see extremes – are so unaware. They think the poor are either beautiful or filthy. Poor people are like other people. Some are good and some are bad. Everybody has hang-ups. It's human. I have white friends who think they have black people all figured out, like some of the students here. They look at me and they look at Gene and they say, 'You're different.' What they fail to see is that everybody is different. Gene and I aren't some sort of rare cases. There are a lot of people like us, and a lot of people who are different. From the beginning of the earth there were poor and rich, and when the earth is destroyed there will be poor and rich. But why do people on the bottom have to be treated like dirt? The poor aren't complaining because they are poor but because they are told so many things they are supposed to get but don't. Like education, community facilities, police protection, garbage pickup. When I lived on Swann Street, in what is considered a 'better neighborhood,' garbage was picked up twice a week. Where I live on 16th Street, it's picked up once a month.

"Some middle-class people come in and try to impose their own morals on people in the ghetto. How can you say a culture is wrong, if you survive in it? People have their own code. If you go around hating people for their hang-ups, you're going to be all by yourself in your own little bag. Maybe you have some hang-ups of your own that are worse than theirs."

(5) Different speech pattern: A distinct speech pattern is usually found among the culturally-disadvantaged. It is oral rather than written. It is a language of communication. Efforts to move the group toward accepted standards of reading and writing are generally difficult.

(6) A resistance to formal school: The traditional school has "book learning" as its symbol. The culturally-disadvantaged feel that this approach is unrealistic and farcical. In the minds of the culturally-disadvantaged, reading and writing and the entire "school" approach to life are not relevant to their needs. Their concern is for "now" and not tomorrow.

(7) Unique concept of the future: The culturally-disadvantaged is overwhelmed by today. To him there is no conceptual entity called the future. His concept of the future is today. He sees no change in his world, he sees no promise of change. He has learned the despair of yesterday and the reality of today. The third dimension of tomorrow does not belong in his world. It has never come to him, his family or his friends. To ask the culturally-disadvantaged to build his hopes on the promise of tomorrow is quite often something which is impossible for him to comprehend.

(8) Isolation: Personal and physical isolation is a growing characteristic of the culturally-disadvantaged. Modern technology along with other socio-economic conditions had carved a cultural chasm which is widening each day. The culturally-disadvantaged sees people move along, stores disappear, churches move, highways and expressways further isolate him. The world which he once could at least visit now drifts further and further away. Personally, the disadvantaged sees his problems as uniquely his own. While he may be willing to help others, he isolates himself personally and psychologically from his friends, his family, his teachers and the world.

In summary, the culturally-disadvantaged may be characterized by (1) poverty; (2) disordered family; (3) lack of motivation for book learning; (4) a unique and different culture; (5) different speech pattern; (6) resistance to formal school; (7) a unique concept of the future and (8) isolation. Quite obviously, we cannot singularly apply any one of these characteristics to a person and claim that he is disadvantaged. Collectively, however, the culturally-disadvantaged do bear these general characteristics.

Now that we have defined the main elements of our problem, how do we proceed with the task of changing attitudes of industrial arts teachers to meet the needs of the culturally-disadvantaged? The first tendency of those who address themselves to the problem is to oversimplify the matter. Therefore, we must hasten to say that the task is one that should not be oversimplified. The major facts are clearly before us. (1) Industrial arts teachers have not traditionally been educated for the job at hand; (2) the entire area of changing attitudinal behavior is one of the most complex which we might tackle; and, (3) despite the recent avalanche of materials on the culturally-disadvantaged, much of it has not been read by industrial arts teachers, and much of it might not be very significant even if it were read.

There are many approaches which can be taken in an effort to change attitudes of industrial arts teachers in meeting the needs of the culturally-disadvantaged. We will consider only the following: (1) Changing the pre-service preparation of industrial arts teachers; (2) emphasis through in-service industrial arts teacher education programs; (3) efforts through research, demonstration and pilot projects; (4) a new thrust in industrial arts to focus emphasis on the changes to be made in people rather than the changes which are to be made in new materials.

As indicated earlier, the contemporary undergraduate curriculum is still materials- and process-oriented rather than people-oriented. The end of all education must become the people. The undergraduate and graduate programs must be based upon the premise that the technology exists to serve people. The foundation for industrial arts must shift from crafts, manufacturing and technological processes and move to the human and behavioral sciences. The curricula for undergraduates must include those courses which will produce positive attitudes about people — all people . . . those in the local, regional, national and international community. When undergraduate and graduate students know more about individual and group behavior and cultures, we should get changes in attitudes which will meet the needs of the culturally-disadvantaged or any group which we may be asked to teach in the future. This approach in undergraduate and graduate education does not imply a de-emphasis on technology. In fact, it is simply what Dewey spoke of when he referred to education as meaningful life and experience.

Probably an immediate impact can be made on changing attitudes through in-service experience for industrial arts teachers. This convention meeting is an example of one of many types of in-service experiences. Others may range from formal graduate courses to single personal introspection. To assist in speeding up results, individual teachers can begin reading more actively in the area of individual and group behavior patterns. There is available to industrial arts teachers a complete ERIC Center on the culturally-disadvantaged at Yeshiva College in New York. Most of the material is available from this Center on micro-fiche or in hard copy. Bibliographies are published periodically and should be a part of the library of every school if not of every teacher.

More research, experimentation and demonstration effort is needed by the industrial arts profession in the area of human resource development. Pauline Sears (5) used an approach which has implications for industrial arts teachers. In a study entitled "Attitudinal and Affective Factors in Children's Approaches to Problem-Solving," the author pointed out the following: "Problems which will engage a child's endeavor must hold promise of success at something which he values as a result of his previous experience in his own sub-culture." Sears points out that the proposition suggests (1) an analysis of the problem situation by the problem solver; and, (2) an analysis of the resources which the student can bring to bear on the problem. These include (1) cultural pre-dispositions based on parental values for his sex and social class; (2) his mental ability, past experiences at similar problems, cognitive styles, social skills and physical development; and (3) a moderately-well-formulated set of motives which serves to impel him toward work on problems or toward some competing activity.

Other types of attitudinal research should also be conducted by the industrial arts profession with particular application in the field of group and inter-group relations. I particularly call your attention to a typical study which was done by Cartwright, entitled "Achieving Change in People: Some Applications of Group Dynamic Theory." Cartwright's report applies to changing teachers as well as students. He develops eight basic principles for change. They are as follows:

Principle No. 1. If the group is to be used effectively as a medium of change, those people who are to be changed and those who are to exert influence for change must have a strong sense of belonging to the same group.

Kurt Lewin described this principle well: "The normal gap between teacher and student, doctor and patient, social worker and public, can... be a great obstacle to acceptance of the advocated conduct." In other words in spite of whatever status differences there might be between them, the teacher and the student have to feel as members of one group in matters involving their sense of values.

Principle No. 2. The more attractive the group is to its members the greater is the influence that the group can exert on its members.

This principle has been extensively documented by Festinger and his co-workers. They have been able to show in a variety of settings that in more cohesive groups there is a greater readiness of members to attempt to influence others, a greater readiness to be influenced by others, and stronger pressures toward conformity when conformity is a relevant matter for the group.

Principle No. 3. In attempts to change attitudes, values, or behavior, the more relevant they are to the basis of attraction to the group, the greater will be the influence that the group can exert upon them.

Principle No. 4. The greater the prestige of a group member in the eyes of the other members, the greater the influence he can exert.

Principle No. 5. Efforts to change individuals or subparts of a group which, if successful, would have the result of making them deviate from the norms of the group will encounter strong resistance.

Principle No. 6. Strong pressure for changes in the group can be established by creating a shared perception by members of the need for change, thus making the source of pressure for change lie within the group.

Principle No. 7. Information relating to the need for change, plans for change, and consequences of change must be shared by all relevant people in the group.

Principle No. 8. Changes in one part of a group produce strain in other related parts which can be reduced only by eliminating the change or by bringing about re-adjustments in the related parts.

As Cartwright indicates, these principles are but a few emerging from the research in group dynamics. The industrial arts profession must develop a body of literature applicable to its profession and learned by its members before any significant inroads can be expected in changing attitudes among teachers in the field.

The final observation to be made in this paper concerns the development of a new thrust in industrial arts to focus emphasis on the changes to be made in people rather than the changes which are needed in our material resources.

If the industrial arts teacher is sincere in his efforts to meet the needs of the disadvantaged, there are a few simple things he can do immediately. First, the industrial arts teacher must ask himself if he truly, honestly and sincerely wishes to have a proper attitude to work with the culturally-disadvantaged. If he can answer this question with fidelity, then the next step is simply to "get involved." Upon getting involved, you may wish to use the following as guidelines: (1) Accept the student as he is with all the rights and dignity that any human being possesses. Accept him without qualification. You can work on changes later; (2) Don't use his prior behavior pattern or performance standard to predict his future. Let him understand you are starting without prejudice; (3) Make all or as much as possible of this training applicable to his needs, and let it be as concrete and immediate as possible; (4) Don't be too perfect yourself and don't expect much perfection from the student. You can achieve your goals later, and you may be surprised at his level of self-expectation and performance; (5) Be prepared to have your patience tried, your standard lowered, your dreams modified. Be prepared to have your sincerity questioned, your faith doubted and maybe your heart broken; (6) Believe in what you are doing. Believe in it with all your heart, all your intellect and all your being, and, finally, don't give up.

If you can look at yourself and really believe that you can and will follow these guidelines, then you are already changing your attitude, and you may be well on the way to developing the qualities which industrial arts teachers must have to meet the needs of the culturally-disadvantaged.

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Preparing industrial arts teachers for disadvantaged children in our urban centers

James J. Buffer

(Ed's. Note: This article represents only a portion of the convention presentation. The complete report may be obtained by writing the author, whose address can be found at the conclusion of this paper.)

Preparation of Teachers. Current teacher education programs are not adequate to prepare teachers of disadvantaged children. Teachers have complained that their educational psychology and methods courses were inadequate. Also, their student teaching experiences of 6 to 18 weeks of part-time classroom involvement did not provide them with the necessary skills and techniques to cope with deviate behavior.

Recognizing the shortage and tremendous need for industrial arts teachers for the disadvantaged students in urban communities and also the fact that teachers require special educational preparation and field experiences, one would most likely begin to modify the in-service phase of the teacher education program. I would have to agree with Professor William Wayson of Syracuse University, however, that special undergraduate programs will not attract large numbers of prospective teachers even to approach the needs of urban schools. Perhaps the greatest efforts should be made to modify the in-service teacher preparation programs to assist with the development of existing staffs both to keep them in the urban schools and to improve their effectiveness as teachers. (Wayson) If retrained experienced teachers begin to have more success in modifying the educational and social behavior of inner-city children, perhaps teaching in these hard-core schools would become more attractive to pre-service teachers.

Pre-service training. Briefly, let us review some suggested components of a pre-service teacher program. It is generally agreed that, earlier in the students' formal education, they should study about the social, educational, cultural, economic and psychological characteristics of disadvantaged children, their parents and their community.

Prospective teachers should have some contact with the disadvantaged early in their program. This may be accomplished by requiring field experience for the undergraduate – working in a settlement house, YMCA, community organization, welfare agency, or similar social agency.

It is imperative that pre-service teachers have early experiences with students. This can be accomplished using small groups of students in a micro-teaching situation. This early and continued interaction and experience provides pre-service teachers with the opportunity for longitudinal supervised growth and skill development in instructional competencies and also provides them with an opportunity to explore and evaluate their professional-occupational aspirations.

Recent developments in educational-instructional technology have provided teacher educators with a number of useful effective methods of preparing teachers. Now in addition to the lecture-demonstration method of teaching teachers how to teach – "do as I say, not as I do" – we have (1) simulation motion pictures developed by Kersh at Oregon State and another variety developed by Cruickshank of the University of Tennessee; (2) micro-teaching; (3) stimulus films programs; (4) interaction analysis; (5) non-verbal behavior communications, and (6) Critical Moments in Teaching series of motion pictures. Also, there are a number of innovational programs of projects under way in teacher education, such as the M-Step Project, TEAM Project, the Dial-Access Programming, and the Ohio State University-Cleveland Public Schools Clinical Teacher Education Program.

During the sophomore year, the student should begin to spend three to five hours per week in an urban school as a teacher aide. This experience will allow him to get a feel for the school, its organization and operation, the children, and the community. Observation and participation in the administrative and instructional program of the school are required. The teacher aide's performance would be directed by the university professor; however, his field work would be coordinated and also evaluated by a master teacher in the school system who may serve as an adjunct field professor. "Professional methods" courses and seminars will be conducted for credit in the schools by the field professor. The teacher aide would also be paid a modest professional honorarium for his services. This experience should also continue during his junior year of teacher preparation.

There are some teacher educators who are advocating that the prospective teacher continue serving as a teacher aide until he graduates. His "student teaching" would be performed as part of a fifth-year teacher internship for which he would be paid a salary. This is somewhat similar to the field experience requirement for the Master of Arts in Teaching (MAT) degree program, in which non-education graduates enroll in a two-year master's program that incorporates a paid teaching internship with two years of graduate study.

The fifth year would serve as a time for remedial study of instructional technology and the implementation of innovative programs and techniques. Also, the new teacher would be interning full-time for one year under the supervision of an adjunct field professor (a master teacher employed by the urban school system who also provides professional services to a cooperating university). I am in complete agreement with the values of the fifth year of supervised teaching experience. However, I would recommend that the pre-service teacher function as a teacher-associate for 3 hours per day for 20 weeks during his final semester of undergraduate study. This experience will help him with the transition from a student teacher-aide to a full-time teaching position. I would also recommend that the teacher associate be paid a stipend for his professional services as a member of the city school system's university clinical team. (See p. 161 for a discussion of the clinical team approach.) His fifth year of field experience then may be served as a paid teaching intern and be part of the new teacher's tenure accruing experience.

Graduate teaching assistants. Recently, we have seen a phenomenal growth in the junior college programs throughout the United States. Perhaps we should begin to give some serious consideration to the two-year preparation of teaching assistants or associates in industrial arts. Many graduates of two-year technology programs are transferring to colleges and universities to complete the requirements for the baccalaureate in industrial arts education. I recently talked with Mr. Clovis Ferguson, Assistant Director of Vocational Education, Dearborn (Mich.) Public Schools, about this topic (April 2, 1969). He has observed that their two-year community college graduate receives a "better" technical background in areas such as electronics and power mechanics than many of the graduates of our four-year programs. These graduates could fulfill a need for more qualified laboratory instructors. I would strongly recommend that those teaching assistants with associate degrees be required to complete their BS degree in order to retain their temporary certificate.

The teacher-coordinator described in the in-service section of this report could provide the teaching assistant with remedial assistance and teacher education credit in the "field" during the school year, much the same as the teacher-aide and teaching intern. The adjunct field professor then would be similar to the traveling T & I teacher trainer, except that he would remain primarily in his own school district.

Involvement of community groups. One of the problems teachers and administrators are encountering today is the pressure created by certain ethnic groups and community organizations. For example, a Puerto Rican community organization in Chicago has said that it wants to receive and administer the Title I (ESEA) Federal money appropriated for remedial reading programs rather than leave the job to the Chicago Board of Education.

Also, certain black groups have advocated that the university waive its entrance requirements for school dropouts and others, to enable them to take a special two-year teacher training program. However, some do not want to become teaching aides or assistants, but fully-certified teachers, after the two-year program. They claim that the cultural differences of the white and black community foster inferior education and that this could be eliminated by utilizing black people as teachers. My position is that as many people of all racial, ethnic, national and religious backgrounds as possible should be recruited to prepare as prospective teachers of the disadvantaged. However, just as I would not want a retarded (aptitude, achievement or experience) or quasi-trained person filling my teeth or removing my appendix, I would not want a person of similar caliber teaching my children. Potential teachers should be capable, professionally competent, personally and psychologically adjusted people who have a sincere interest, love and empathy for their fellow man. We must expend all of our resources to recruit qualified applicants.

Para-professionals. We should, however, not overlook the large numbers of people from disadvantaged communities who have the personal interest, ability and desire to help teach young children. Although some may lack the educational aptitude for university study and be deficient in academic achievement, their talents may be utilized in the schools as auxiliary personnel known today as para-professionals.

The employment of the para-professional in education has gained impetus during the 1960's. Teacher aides and teacher assistants are common in many industrial arts laboratories today. Many of the para-professionals are retired tradesmen who assist regularly-certified teachers with material preparation, tool and machine maintenance, inventory and requisition of supplies, and clerical assistance. Some of the para-professionals, depending on their past experience, training and ability, may also assist the professional teacher with conducting tutorial lessons in the laboratory.

Personnel for para-professional positions, such as teacher-aides and laboratory assistants, may be recruited from the disadvantaged community. The involvement of members of cross-cultural and cross-clan backgrounds serves six purposes:

(1) It provides an adult model in a professional setting with which the disadvantaged child can associate.
(2) The involvement of the poor and "indigenous leaders" in the school setting provides teachers with crucial insights not available to middle-class persons.
(3) A large number of sub-professional jobs are made available to the poor.
(4) Some responsibility for the improvement of education, social ambitions and the behavior of disadvantaged children would be placed with the disadvantaged adult.
(5) The professional training and experience received by the disadvantaged adult help to improve his own self-concept, social attitude, awareness and involvement in improving social-cultural conditions.
(6) The involvement of professionally trained auxiliary staff improves the efficient operations of the school and learning experiences of children.

In-service teacher preparation. The purpose of this program is to prepare instructional teams composed of three experienced industrial arts teachers (or two teachers and one supervisor) selected from schools located in disadvantaged communities of large urban areas, such as Chicago, Cleveland, Detroit, New York, St. Louis, Los Angeles, Washington, DC and other similar metropolitan areas, to serve primarily as "change agents" in industrial arts for the disadvantaged. The program will extend over a 12-month period, with teachers studying on a university campus and also in urban schools. Teachers will develop a complete "instructional system", including curricular materials, teaching aids and models, and will return to their urban school systems to conduct in-service workshops as teacher-coordinators (instructional specialists) to the school system and its teachers. They will function as "change-agents" serving as a liaison among universities, their local systems, and their professional organizations by participating with field research activities and in the field preparation of teachers (pre-service and in-service). (See Figure 1 for an operational model of the proposed program.)

Advantages of the program. A short-term summer program does not give the teacher participants an adequate amount of exposure to studying the field of social, cultural, economical and educational deprivation. While it would be possible in a concentrated eight-week course to study the general characteristics of the disadvantaged and to develop lesson plans and a few curricular materials, one would not have the advantage of field-testing the materials. Furthermore, there is not adequate time to develop what is really needed to fill the void in industrial arts education, that is, a complete instructional system designed and based on the needs, capabilities and interests of the disadvantaged. A study of the cultural, economic, sociological and psychological factors influencing the development of disadvantaged youth, coupled with an intensive study and application of pedagogy, should provide a frame of reference from which one may develop appropriate instructional materials.

The teacher's educational program also should embrace a practicum and an internship activity in which the experienced teacher will spend considerable time gaining experience and applying classroom-learned concepts and techniques with children. As an example, The Ohio State University has developed a "clinical team" approach in cooperation with the Cleveland and Columbus public schools to help improve the teaching-learning processes in urban areas. Therefore, a realistic "laboratory" is available to student

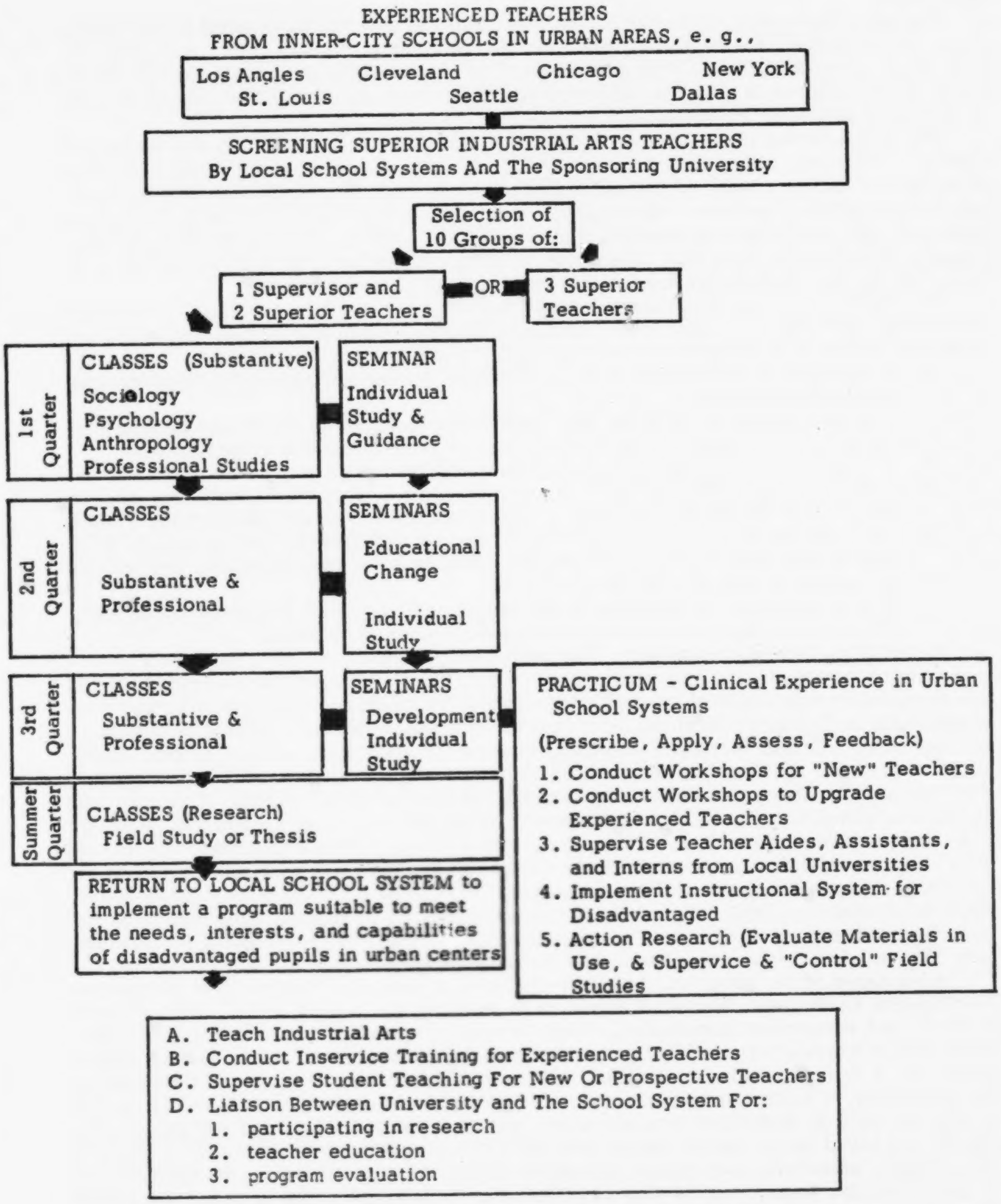
EXPERIENCED TEACHERS
FROM INNER-CITY SCHOOLS IN URBAN AREAS, e. g.,
Los Angles
Cleveland
Chicago
New York
St. Louis
Seattle
Dallas
SCREENING SUPERIOR INDUSTRIAL ARTS TEACHERS
By Local School Systems And The Sponsoring University
Selection of 10 Groups of:
1 Supervisor and 2 Superior Teachers
OR
3 Superior Teachers
1st Quarter
CLASSES (Substantive)
Sociology
Psychology
Anthropology
Professional Studies
SEMINAR
Individual Study &
Guidance
2nd Quarter
CLASSES
Substantive &
Professional
SEMINARS
Educational Change
Individual Study
3rd Quarter
CLASSES
Substantive &
Professional
SEMINARS
Development
Individual Study
PRACTICUM - Clinical Experience in Urban School Systems
(Prescribe, Apply, Assess, Feedback)
1. Conduct Workshops for "New" Teachers
2. Conduct Workshops to Upgrade Experienced Teachers
3. Supervise Teacher Aides, Assistants, and Interns from Local Universities
4. Implement Instructional System for Disadvantaged
5. Action Research (Evaluate Materials in Use, & Supervice & "Control" Field Studies
Summer Quarter
CLASSES (Research)
Field Study or Thesis
RETURN TO LOCAL SCHOOL SYSTEM to implement a program suitable to meet the needs, interests, and capabilities of disadvantaged pupils in urban centers
A. Teach Industrial Arts
B. Conduct Inservice Training for Experienced Teachers
C. Supervise Student Teaching For New Or Prospective Teachers
D. Liaison Between University and The School System For:
1. participating in research
2. teacher education
3. program evaluation

Figure 1. Model of Proposed In-Service Teacher Preparation

teachers, teachers and teacher educators to use for action research and implementation of instructional materials, methods and organization.

The instructional system will be tested with students in a micro-teaching situation during a practicum. Additional supervised field experience will be acquired by the teachers' participation with the clinical group in the inner-city schools. Teachers will have an opportunity to teach the disadvantaged, conduct in-service training for prospective and experienced teachers, participate in field studies, and evaluate the effectiveness of new materials and methodology during their supervised clinical experience. It is expected that the teachers will perform similar duties when they return to their local systems at the end of the academic year.

Objectives. The general objective of the program is to prepare teams of experienced industrial arts teachers and supervisors to serve as change agents of industrial arts in socially-disadvantaged communities of large urban areas. The specific objectives of the program are as follows:

(1) To help participants understand the social, cultural, psychological, physical and educational characteristics of the socially-disadvantaged.
(2) To acquaint participants with methods of organization structuring and teaching students with learning disabilities.
(3) To assist participants in trying to improve their skills of diagnosis, prescription, assessment and feedback of student and teacher skills.
(4) To help participants develop an internally-consistent rationale for projecting curricula in industrial arts.
(5) To acquaint participants with the instructional system and materials designed by current curriculum projects (American Industry, Orchestrated System, IACP, etc.) for introducing contemporary industrial technology in the public schools.
(6) To help participants prepare an instructional system and materials, based on an acceptable, logically-derived rationale developed by one of the curriculum projects (such as IACP) which would be suitable for teaching industrial arts to the disadvantaged.
(7) To acquaint participants with the methods and techniques to implement curriculum change and educational innovation.
(8) To provide participants with the method and techniques to help supervise teaching and improve the teaching-learning process.
(9) To acquaint participants with the techniques and methods used in curriculum and educational development, research and evaluation.
(10) To help participants increase their efficiency as educators by interacting with educational specialists and resource people from education, business, labor, government, and other social agencies.

Formal study. The instructional program is organized so that the participants will begin their training with the substantive courses in anthropology, psychology, social work and sociology. These courses, together with their first practicum, will provide an understanding of the roles of families, communities and cities in the behavior, aspirations and achievements of disadvantaged children.

With the information and abilities developed in these cognate areas, the teachers will operate with a new frame of reference when enrolled in the professional education courses, including development activities, the second practicum (clinical and field experiences), and the evaluation of instructional methods and systems.

Substantive areas. Anthropology - Human Behavior and Social Environment.

The participants will study the determinants of cultural functioning examined at the individual, group and community levels of analysis with attention to stress, sub-cultural and socio-economic processes and conditions.

Sociology - Sociological Analysis of the Community.

Students will study the emergence, nature and problems of modern urbanism with an emphasis on the role of the community, the city and its residents in social organization, disorganization and contemporary social problems.

Psychology - Educational Disability.

This course will provide participants with an overview of theory and practice including causes, diagnostic procedures, remediation and instructional materials for students with educational disabilities.

Education (cognate). Education of the Emotionally- and Socially-Maladjusted.

Participants will study the principles and methods which may be used in the schools in the adjustment of behavior-problem children.

Organization and Administration of Guidance Services.

This course will prepare participants to select, develop and organize materials and methods to provide educational and vocational guidance services. Participants will become acquainted with the guidance and counseling services available in the schools and governmental and public agencies.

Fundamentals of Instruction.

This course will focus on the fundamentals of instruction, with an emphasis on "educational technology" and the processes of assisting teachers in improving their instructional programs.

Seminar in Educational Change.

This seminar will orient the Fellows to the processes of implementing change in education.

Industrial arts education. Education - Practicum in the Problems of Public Education.

This practicum will be devoted to a comprehensive study of the issues and problems related to the education of the disadvantaged pupils enrolled in schools located in socially- and economically-impacted communities of urban areas. The role of industrial arts as part of the educational program for the disadvantaged will be emphasized. Inner-city schools will be visited to observe current programs for the disadvantaged. Consultants from substantive (cognate) areas, inner-city schools and governmental agencies will participate.

Education - Individual Studies in Industrial Arts Education.

This study will be spread over the four quarters and will serve as a discussion period between the staff and participants for evaluation and adjustment purposes.

Education - Industrial Arts in the Elementary School.

This study will be devoted to the selection, development and evaluation of instructional units for classroom and laboratory situations which would be of value for disadvantaged pupils in the elementary school. Industrial arts will be treated both as a body of knowledge and as a vehicle to improve the teaching-learning processes in other elementary school subjects.

Education - Industrial Arts Curriculum Planning.

This course will orient the participants to curriculum theories in industrial arts and allow them to develop their individual beliefs about the rationale, content and structure of industrial arts subject matter.

Education - Practicum in Industrial Arts Education.

This will be field experience in improving teaching and supervisory skills.

Education - Seminar in Industrial Arts Education.

This seminar will allow participants to develop instructional materials, plan their curricular change strategies, and evaluate and modify their "instructional system" for the disadvantaged.

The teacher-coordinator. This new program, with its stress on interdepartmental study and "clinical" emphasis in the field, will prepare a new breed of specialists to serve as teachers and coordinators of industrial arts for the disadvantaged. They will serve as teachers of the disadvantaged (about two hours per day) and teach demonstration classes (those which may be observed by "new" teachers, teacher interns, prospective teachers and experienced teachers). Therefore, they will serve as adjunct field professors representing their local school systems but also providing a professional service to the teacher-education institution, which will assign prospective teachers to the school as teacher aides and teacher interns.

The demonstration classes taught and coordinated by the teacher-coordinator will serve the following purposes:

(1) Trying out of newly-developed curricula materials.
(2) Trying out of techniques of teaching, including methodology, organization of the class (small groups, large groups, individual instruction, team teaching and the like).
(3) Provide supervised teaching experience for pre-service teachers in real school situations.
(4) Provide supervised teaching experience for in-service teachers seeking new information and assistance to upgrade and improve their teaching ability.

In addition to teaching and coordinating demonstration classes, the teacher-coordinator will:

(1) Visit the various schools in his school system to provide other experienced teachers with assistance in improving their instructional programs for the

disadvantaged.

(2) Conduct professional seminars for pre- and in-service teachers in the urban school (credit to be conferred by cooperating university).

(3) Participate with teacher education institutions who are conducting field research studies in his school system.

(4) Collect and disseminate research findings, instructional materials and professional literature to the industrial arts teachers in his school system.

(5) Develop cooperative working relations and professional assistance with other educators, community leaders, local government agencies, and business and industrial leaders to gain support and improve industrial arts programs for the disadvantaged.

The teacher-coordinator will function as a change agent providing guidance, direction and leadership for the improvement of education in inner-city schools.

Supervised clinical experiences with disadvantaged students. An important and significant phase of the program is the second practicum in which teachers will try out the new techniques, methods and instructional materials which they have developed with groups of disadvantaged students in urban schools, beginning with their first quarter on campus. During this first practicum, teachers will visit the local inner-city schools and observe classes. Experienced teachers, supervisors and school administrators of the disadvantaged, and professors, social welfare representatives, community leaders and representatives of governmental agencies will be invited to participate as consultants during the first practicum as a means of obtaining information, guidance and direction for the participants to help improve education for the disadvantaged.

The use of a video-recorder and audio-tape recorder will help develop and improve teaching skills, including teacher-student interaction in the classroom. In addition to micro-teaching, simulation films, interaction analysis techniques, non-verbal communication techniques, and stimulus films will be incorporated as part of the training program.

The teachers' supervised-teaching experience (second practicum) will be enhanced by their participation in an innovative approach to teacher education for inner-city schools. They will have an opportunity to observe teachers, teach classes, participate as members of teacher-supervisor conferences; and select, develop and evaluate instructional materials and methods in cooperation with University-Urban School "clinical teams." Two clinical teams should be formed, each including the following: a campus professor of teacher education, a subject matter person(s), an adjunct field professor, a learning specialist, an environmentalist, a graduate student cadre, an appraisal specialist and a master teacher. The industrial arts teachers participating in the program being proposed will have the opportunity of working directly with the clinical teams in the field and on campus, thus benefiting from their research and developments.

The participants will return to their school systems and assume the roles, not of traditional supervisors or industrial arts teachers, but of teacher-clinician-coordinators. Therefore, it will be necessary for them to learn and practice the techniques necessary to diagnose, prescribe, assess and feedback both student and teacher behavior. Actual practice in this role as a teacher-clinician-coordinator will be provided the participants by both simulation and intensive field experience.

Each of the participants should have a minimum of thirty supervised teaching contacts (thirty days, six hours each day, spent in field schools) with disadvantaged pupils in the cooperating schools. Also, since the participants will gain their field experience in an urban school system and work as part of a clinical team, a number of their classes will serve as demonstration classes for prospective (pre-service) students, new teachers and experienced teachers.

In essence, the practicum will serve as a vehicle in which the teachers will be a part of the "clinical team" developing basic insights and skills, learning how to give in-service education to other teachers in the schools, and developing techniques of implementing curricular change for the education of the socially- and economically-disadvantaged.

The participants will also work cooperatively with a clinical team to evaluate the instructional program implemented in the inner-city schools and then disseminate the findings to other participating teachers and to the profession.

Conclusions. It is of paramount importance that we modify existing teacher training programs to prepare effective teachers of the disadvantaged. All of our professional resources must be directed toward this goal to help improve the educational, social and economic functioning of children in our inner-city.

We have regional educational laboratories participating in research and development ventures. Why not pool the resources and talents within our states and develop cooperative teacher preparation programs involving more than one state university? A few universities have begun to develop innovative teacher education programs in cooperation with urban schools. However, most of these have been urban universities and colleges.

As professional educators, we are socially accountable to provide effective instructional programs and teaching personnel to meet the demands resulting from our changing technological culture. The urban communities and their schools (as well as the local schools near our campuses) must become our teaching-learning laboratories.

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Value differences in inner-city schools

Ralph O. Gallington

A school may be defined as a "social institution" which brings "the child to share in the inherited resources of the human race." This definition was first espoused by John Dewey in his "Pedagogic Creed" of 1897. Although we almost revere the life and works of John Dewey, it is hardly conceivable that, if he were alive today, he would recognize our American schools as such institutions. Probably they were not in his day. He would recognize life today in America as having evolved into a stage where there is developing a strange type of American school, particularly within the inner-city areas. The only thing which could save Dewey and allow him to remain calm and sane would be his pragmatic philosophy.

I am sure he would be opposed to our democratic society supporting two or more totally different public schools with totally different basic philosophies. He would say of our present inner-city schools that they are based on no philosophy whatsoever and that all they require is a set of "abstract" and sophisticated but meaningless "words" and phrases which no one observes or practices. It might be that he would say that these schools are based upon outmoded "customs" and "routines." Many of these words are the words of Dewey himself, and words which I have paraphrased to save time.

What do we mean by "value differences"? Children of the ghettos, slums, inner-cities (or whatever you would prefer that we call them) do not relate to the "outer" city or to "suburbia." They do not relate to rural America. Many children of the city slums have never seen a cow, a brook flowing through a meadow. Some have never heard a mockingbird sing nor have they ever come into contact with the soft spring wildflowers such as grow in our great forests.

How can a teacher of slum children speak of the world, America, science, literature, industry or agriculture? To be understood and to communicate in full measure, as Dewey has suggested, the student must have more than a vicarious experience. He must see, feel, smell, hear and probably taste in order that his senses allow him to comprehend or perceive more fully the world about him. The value "gap" – instead of value "differences" – might well be the subject of this paper.

Who are the people of the inner-city? As we discuss our schools we automatically think of children or adult students. In the inner-city there are very few adults in traditionally-graded classrooms. An extremely high percentage of the adults are school dropouts. And if they do attend school, a significant number do so in order to stay on the relief rolls without loss. However, some adults attend school to learn salable skills in order to be able to provide better for themselves and their families.

Many children who are enrolled in the inner-city schools have poor and disadvantaged parents. Many are from broken homes. In some of these areas over 25 percent of the inhabitants are on relief of some type or another. The children are often unwanted; some are viciously exploited by adults.

It has been observed that value differences of the inner-city youth are reflected by many manifestations not uncommon among other groups. The dropout rate certainly is high among inner-city school youth. The commonly-accepted estimate is that one-third of all youth in these areas will not finish high school. The actual known causes for dropouts among the poor are few, but the manifestations commonly accepted are:

(1) The schools are inadequate, rundown and understaffed.
(2) The students are inadequate from the standpoint of resources and readiness for the work assigned.
(3) The student rejects the school because of society's misunderstood truancy laws.
(4) The student is frustrated by the excessive assignments given him and the limited time he has to spend in school. No time or space is available to him for study at home.
(5) School subjects are irrelevant to the student's life on the outside.
(6) Life is an unhappy one; escape is a prerequisite to happiness.

Life in the inner-city is very harsh. Children at an early age become acquainted with crime and degradation. There are surely many children in these communities with idols who are known to be law violators. Most of the legitimately-employed adults in such communities are unskilled, uneducated and unfit to counsel younger persons. Survival is a daily routine for many youngsters in the inner-city slums. School activities which are practicable in many suburban or small-city schools are not afforded the slum child.

(1) School playgrounds and gymnasiums are closed and locked to prevent vandalism.
(2) Home visitation by teachers and counselors is unsafe. The home itself may be vice-ridden and unfit for children. Children on occasion may be forced to find a night's lodging in a packing box under a stairway.
(3) Local children do not have wholesome school group activities, so they often resort to gang participation. Gang association substitutes for friendships.

The great disparities between the suburban and the inner-city child are as follows:

(1) Health	Disease and addiction
(2) Nourishment, good food	Hunger, spoiled food
(3) Free, safe, secure	Scourged, danger, deception
(4) Well-clothed, clean	Cold and dirty
(5) Having fun	Planning to escape and live sometime in the future or become permissive and become exploited by others
(6) Bright future	Empty future except by some escape design
(7) Friends	Hate gangs, for self preservation

Other factors which differentiate the above groups are based on feelings, philosophies, hopes and aspirations. Some follow:

(1) God is great and good.	God is dead or never has been.
(2) Life is beautiful and full of fun.	Life is dirty; its stench is overwhelming.
(3) Help others.	Help myself.
(4) Education is life.	Education (school) is a killing experience or a bore.
(5) Science paves the way for my future.	Science has passed me by.

Schools in the inner-city are inadequate and cannot create the environment for learning as set forth by John Dewey. Housing in the slums is poor and unsanitary, and it contributes to delinquency, disease and degradation. Children of the inner-city cannot relate to or communicate with the world outside. Good schools and good housing alone would fail to diminish the value differences among our children unless well-trained and accepted teachers, counselors and civic-minded persons become concerned and involved with change. This change cannot be effected unless rapport is established between those who live in slums and those who work to eradicate slums.

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Shop and laboratory safety in the inner-city schools

Grovnor H. Kerr

Safety is a positive and personal matter. As the teacher, I have the responsibility of emphasizing the positive approach to safety education. I do this for several reasons. First, I wish to direct my lectures, and my demonstrations, to each pupil as an individual, rather than to an impersonal member of a class that might total thirty pupils. I wish to cause an understanding by each pupil of a correct way to function safely and effectively in an environment of machines provided with safety devices for pupil protection. I place emphasis on the use of protective devices by stressing the concept that "doing the job safely is much more important than getting the job done". This concept lends itself to the thesis that when you take a bum and provide him with a highly-developed training course for a highly-specialized skill, your end human product will be a highly-skilled bum. The person needs, more than anything, attitude motivation.

How does one provide attitude motivation to inner-city pupils? I realized very early in my teaching career that pupils of the inner-city schools require teaching techniques that will certainly tax any teacher's talents. However, it has been my experience that the aspirational level of a given pupil might be raised when the subject matter is presented in a positive way and made relevant to him. Safety as taught in the inner-city schools must have sufficient structured content that pupils will understand and accept its relevance.

Relevance is safety instruction: What can it do for the inner-city child? The lack of relevance is a factor in his inability to function in a mechanical environment, and the need for relevance is the motivation for his learning.

Inner-city children neither understand nor learn methods that might be foreign to their culture. Safety instruction, to which they can't relate, they do not accept. Inner-city children, for the most part, see instructional safety as an obstacle to their goals. They don't plan logical sequences in making a project. To them, this is abstract. If they choose to participate in an instructional program, they, for the most part, want the completed project without any thoughts of achieving the end safely.

It has been my experience that concepts of safety are not geared to the inner-city pupil's need. He cannot be receptive to safety as subject matter that does not make his life more meaningful, or his immediate goals any more attainable. Instruction that is geared to the premise that pupils should have exploratory courses in industrial studies, in order that they might become "acquainted" with methods and techniques as used by our industrial complex, has little or no relevance to the inner-city pupil.

I suffered a rather jarring experience from several of my former pupils when I invited their participation in the class program. I was told in a very quiet and sincere manner that school (per se) and industrial studies particularly had no meaning to them. The concept of learning a skill, or obtaining an education for purposes of earning a livelihood, was quite removed from their life's objectives. The group proceeded to point out that any person has the right to be born on welfare, to be reared while on welfare, to endure the years that involve compulsory school attendance, to drop out upon reaching age seventeen, while still entitled to aid for dependent children until age eighteen, when he then might become eligible for aid to unattached men. Conceivably, their lives might be spent on the welfare rolls. How does one show relevance to pupils such as these? How does a teacher in the inner-city schools lend relevance to safety instruction when some pupils feel that to practice safety is to become vulnerable? A program must be devised whose essence lies in the word motivation.

There are basically three kinds of motivation—incentive motivation, motivation through fear, and, most importantly, attitude motivation.

Attitude motivation involves changing a person's attitude toward his personal concepts of success. In keeping with this theme during the past several years, I have developed a positive expectancy where the pupils are concerned. I expect them to participate in a class safety program. I expect them to observe all safety rules, and I proceed to tell them about safety whenever an opportunity presents itself.

Concepts of safety and safe practices emerge from patterns of attitude motivation, relevance and an understanding of the factors that might contribute to accidents. The inner-city child must perform the necessary tasks in a safety-conscious environment. The school shop provides the environment for the development of concepts of safety and safe habits that might guide the actions of the person throughout his entire life.

Instilling safety into the consciousness and reflexes of the inner-city child requires patient effort and exposure to relevant instruction for an extended period that can only span the 7-through-17 years. We, as teachers, must provide experiences that will become an integral part of the way a pupil works, so that each time he performs a task he will consciously check himself and perform the task in a manner that will be safe for him and for the environment.

If we accept the premise that patterns are formed in part from experiences and environmental background, then the school shop is deeply involved in the developing of sound concepts of safety and attitudes, pertaining to residential, occupational and recreational safety. The shop and laboratory in the area of the inner-city school must include programs of safety instruction that provide for changes in human behavior where the so-called "hard core" are concerned.

Each teaching-learning-performing situation must be structured so that the probability for promoting concepts of safety through correct work habits is favorable. The teacher must provide continuing efforts to include proper environment, efficient and safe procedures as a model or example for the inner-city child.

The experiences shared by the pupils in the school shop of the inner-city schools at the junior high level are for the most part terminal educational experiences. With this single thought in mind, program content must be structured so that the pupil will be encouraged to broaden his experiences in order that he might function safely within his chosen environment.

I have presented to you my philosophy regarding safety, and perhaps I have given you some insight into the goals that I seek as an educator. I began my tenure with the Los Angeles City School District well over a decade ago. The experiences that I have shared have been at the junior high school level. My most recent assignment is at Charles Drew Junior High School, which is located in the vicinity of Watts.

The subjects that I teach are industrial crafts, or plastics and woodworking. At this point, I would like for you to know that I am perhaps the one person who is most aware of the observance of safety in school shop and laboratory. I have had only two reportable accidents during my teaching career, one to my left thumb, the other to my right hand. The news from each accident served to reinforce student acceptance of the program that I presented to them that encountered problems in the school shop related to accident prevention.

The problem of the non-reader is the most pressing or perhaps most depressing problem. What can safety instruction or accident prevention programs do for the non-reader? To the non-reader, relevance has little or no hope or meaning. To the poor reader, perhaps some meaning, but by whose standards? I have sought new and different methods to teach accident prevention and relate the concepts to the non-school shop environment. We have sought and used techniques of instruction that produce results for the educationally-oriented student and the good reader. We have sought and learned techniques to help the poor reader, or the pupil who doesn't read at all, in order that safety instruction might be meaningful to him. Programs have been devised to reach the severely-deprived pupil who is burdened by education, and whose patience is taxed by the compulsory attendance law. We hold a belief that the students whose world is as narrow as the confines of the Watts boundaries, and who have never ventured out, can learn. We have sought to impart an awareness of safety for the pupil whose social and educational experiences are so limited, that his total concept of the other society is based on what he sees on television. The premise that led to the programs I mentioned was devised and passed to Mr. Scott and to me by Mr. Kenny Bruce, our master teacher, who provided leadership during the practice teaching experience. He often expressed the idea, "Before you can teach them, you must first reach them."

Safety instruction, as with all education, must be relevant. It must not be contrived. Concurrently, you must teach basic learning skills. Teach your pupils to listen. A pupil who does not listen cannot learn. Devise relevant instructional material on safety that will be a contributing factor to his sharing in the educational processes. Help and teach those who cannot read, to read. Perhaps this will provide an incentive toward further participation.

During the course of instruction, I have brought in problems involving safety of the most immediate area, problems to which pupils might relate. To insure communication, I present lessons in the vernacular. On some occasions I use some slang expressions.

I make every effort at my disposal to effect a dialogue with my students.

By some standards, improvement of a pupil's acceptance of safe shop or industrial laboratory practices might appear insignificant. The teacher must fulfill the obligation with which he is charged by doing his utmost to reach them, so that he might teach them.

You educators have the responsibility of providing your students with sufficient skills and knowledge in order that they might teach successfully in any ethnic environment. Curriculum might be structured to include teaching methods that have been successful in inner-city schools. You have colleagues performing with significant success in these schools. You might visit with them or convene with them to seek their knowledge and incorporate it into your curricula. Arrange to have your students visit the inner-city school during their undergraduate years. Let there be a sharing of problems with educators and employers on a much greater scale where attitudes of the inner-city person are concerned.

Attitude changes regarding safety, or any other facet of industrial studies, require a highly-skilled and dedicated teacher. The need for such a person is greatest in the shop and laboratory of the inner-city schools.

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Accident prevention in the shops and laboratories of inner-city schools

Curtis C. Jones

This discussion includes some of the problems related to accident prevention in the inner-city secondary schools. It is supposed to reflect some of the difficulties encountered in implementing an overall safety program with attention given to eye safety, machine guarding and facility arrangement. In Kansas City, Missouri, we have ten senior high schools, seven of which are considered to be in the inner-city. I tried to include as many interviews as possible for this presentation.

The first problem is in the area of counseling. This, I feel, is the result of lack of interest or misunderstanding between the counselors and the industrial arts teachers. They begin by sending most of the non-college-bound students into these programs, then enroll students in shop classes to complete their program. Some may have physical and mental handicaps, plus having no interest makes it difficult for the industrial arts teacher at the very beginning of instruction. For the most part, these students become bored very easily despite all efforts to motivate them. They are quite hostile and destructive. There is no or limited cooperation with teachers and other students. School, they feel, is a "bad scene," a "nowhere" place, and they stop trying. This is characteristic of only a small percent of students enrolling in shop classes, but it does present big problems.

The next largest problem as I view it is overcrowding. The Board of Education says there are no funds to build new buildings, and voters say they are tired of paying increased taxes. In Kansas City just last week, a bond issue and levy failed to pass. This means that we have to work in old buildings with a limited amount of space, and no place to expand. If and when an annex is made that includes an industrial arts laboratory, the teacher in most instances is not called in for help with the planning. Consequently, the architect makes the storeroom too short, a lighting expert specifies incandescent lamps, and a safety engineer puts the foundry area on wood floors (excluding furnace) and no ventilation system in the welding and hot metals areas. Some schools have the space to operate effectively with average classes, but classes usually have from twenty-five to thirty-five enrollees. With sufficient equipment only for an average class, this presents the problem of students standing around, some playing and some distracting others.

Another problem in preventing accidents is having to work with machinery and tools that are poorly maintained by the repair department. It takes, in some schools, two or more weeks to get an emergency repair order completed. If the order goes through regular channels, it takes considerably longer. With this, we are left with the choice of operating with a malfunctioning machine or shutting it off for a while. When this is done, you must store the equipment, and that takes away from the limited amount of storage space, thus causing another problem.

Along with lack of interest, there is the problem in larger high schools of students trying to protect their property, mainly leather jackets. They are afraid to place them in their lockers, so they must wear them to class. While in class, they don't want to take them off, presenting a hazard especially around machines.

Another difficulty is the students' background, medical and mental. A teacher will receive some students who are allergic to certain chemicals, and this is not explained to the teacher. He must discover this for himself, and in most instances it is after the student has been exposed to the chemical.

Along with this, some of the students have a low IQ, and almost all are unfamiliar with terms, materials and tools used in the industrial arts shops. We find ourselves teaching entirely too many special students, along with our regular students, making it difficult for the teacher to teach at so many levels.

Another sore thumb is classroom interruptions, absentees, and lack of fees and materials. Teachers have the problem of sending Johnnie to the office, students transferring from various classes the second grading period, students moving from other cities, some being released from correction homes and put into class anytime during the year. Students are also late entering school. The above situations require a tremendous amount of clerical work by the teacher. In addition, these interruptions make it difficult to include all students in demonstrations or lectures on using proper tools, procedures and materials.

In some systems, the student is responsible for purchasing his materials. In others, the teacher receives the materials on consignment and the student is required to pay a fee. The teacher issues materials according to the student's money or at his discretion. The problem here is having students in class who are without money for supplies. These students become walking hazards.

In cities where you have central purchasing, without state regulations, the purchasing agent just fills the order and is not concerned about the wear and tear on or the utility of the shield or goggle. Some students have the attitude, "It won't happen to me," so it is difficult to get them to use shields and glasses. However, after an accident occurs, it is very easy to get them to use proper equipment. Temporary blindness is one that shakes them.

As for machine guards, some are good and some are dangerous. Many teachers have found that if a guard is heavy, hard to fit, requires a lot of cleaning or interferes with the student in completing his job when desired, he will not use it if not forced. You will find that some guards made in your shop are better than ones purchased commercially.

Some teachers teach the student to use the machines without the guards, then the student learns to respect the machine and not the guard. These teachers feel that the student is less likely to become careless with that particular piece of equipment. The method used is often left to the discretion of the teacher.

When you start arranging your available facilities with regard to lanes and areas required for certain machines, your floor may well look like a jigsaw puzzle. For the most part you will have lanes overlapping, areas running under tables, under walls and various other places. Most teachers try to place their equipment where it will be the least hazardous.

In order to discuss some of the attitudes developed, we must consider two factors, the student and the teacher. "You people might as well be on the street. Don't you realize you need a good education to get a good job? Your project is the same as your job: Good work, good pay; good project, and good grades." The student says, "Who needs a grade?"

Some of the problems in developing a desired attitude include resentment, hostility, open defiance, morality, poor attendance, poor grades and poor study habits. There is always the question of "what will I do with this when it's finished?" With this attitude, it is hard to get students to follow certain procedures. They want to skip about or leave out certain operations. "I am going to throw it away anyway," is usually what he says.

In the inner-city as well as suburban or any other type of school that teaches industrial arts, we believe that up-to-date thinking teachers and supervisors of industrial arts subjects have agreed that safety education is something that should be taught constantly, not just at certain periods of the week, month or year. Each new tool or machine that is introduced and each demonstration that is given should certainly be accompanied with safety factors related to or involved in the performing of the operation being considered.

Finally, if we as teachers are prepared for the student when he arrives and have something definite for him to do, we will have made a giant step in the right direction of "accident prevention."

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instructional systems

Instructional systems--able assistant to wood programs

John Kassay

Society expects today's educational programs to teach students how to live with themselves, how to live with each other and how to make constructive contributions to the society.

Teachers today, regardless of their subject matter area and their teaching level, have an ever-increasing, almost impossible task ahead. Not only must they teach an exploding amount of knowledge to an equally-exploding student population, but also they are expected to do this effectively with a diminishing amount of financial support; and as if this were not enough, there is a more serious problem for today's educators to face – it is that students of this day and age come to school with a greater array of experiences, and for today's teachers to try to shape students with yesterday's educational methodology surely will result in inefficiency, ineffectiveness and, most probably, failure.(1) Dr. S. I. Hayakawa, acting president of San Francisco State College, in referring to one kind of educational methodology, recently stated, "The old-fashioned lecture system revered since the Middle Ages is probably out of date."(2)

While the educational vista may seem anything but sunny, all is not hopeless, for educational subject matter organized and presented in an instructional package or system promises to be, at least in part, an answer to some of our educational dilemmas.

Historically speaking, the term "instructional systems" was first used around 1960. However, James D. Finn (3) in an editorial written in 1956 deals with the concept of instructional systems as then being developed and employed in industry. Since 1960 the increasing use of the term has made it a part of our educational language, along with such related terms as mediated learning, self-instructional systems, individualized instructional systems, poly-sensory instructional systems, multi-sensory instructional systems, packaged education, orchestrated learning and others being conceived this very minute, no doubt. Additional proof as to the relative recency of this new approach to education is shown by the fact that educational systems were first considered important enough to be assigned a heading in the Education Index only as recently as 1965.

Assigning credit for pioneering "packaged education" is quite impossible simply because instructional systems are an amalgamation of what is currently considered best in educational methodology and modern educational technology. It is the result of many creative minds working toward the improvement of education. However, it would be well to point out that in 1964, a few colleges and universities were experimenting with systems design. Syracuse University, Michigan State University and the University of Connecticut had developed instructional systems using primarily audio-visual materials. New courses in physics, chemistry, biology, mathematics and foreign languages for secondary schools were being designed around the "package" approach. The Federal government and private foundations encouraged, through financial grants, research in instructional systems. One recipient of such a grant was the Department of Education of Washington State University, where self-instructional systems in the field of industrial education have been developed. Certain selected "how to do it" lessons are available in the areas of electronics, plastics, welding and building construction.

A definition of instructional systems is appropriate at this time so that we may understand precisely what follows. Donald K. Stewart in an article suggests:

> A learning systems approach is an effort to organize and condense those necessary or desired experiences as concisely and systematically as possible so as to increase the probability that learning will occur in an efficient manner.(4)

Stewart's definition is adequate. However, for our purposes, Leonard C. Silvern's carefully-constructed definition applies better and, furthermore, encourages definitive analyses. Silvern states:

> A system is the structure or organization of an orderly whole, clearly showing the interrelationship of the parts to each other and to the whole itself.(5)

Analyzing the definition, we find that systems have two very necessary ingredients. They are: (1) structure and organization which go to form an orderly whole; and (2) interrelationship of the parts to form an orderly whole. Clarifying further, the orderly whole of an instructional system is that body of subject matter selected to be taught. Content for any system is determined by the needs and abilities of the students and the nature of the subject matter to be taught. This might range from a single concept to a more complex body of information. The parts of an instructional system are those preselected instructional "hardware and software" components which have been carefully chosen on the basis of their ability to instruct and to interrelate to other components of the system.

Kirkpatrick, speaking about components of a system, mentions a few in this manner:

> Films, tapes, slides and programmed materials are utilized in a 'packaged' self-instructional system to present all necessary information and instruction for a course.(6)

All instructional systems have certain common characteristics; for example, they are multi-media in nature, in that they utilize more than one form of media for presenting instructional material; this is done to facilitate instruction. A multi-media presentation offers the learner, usually on an individual basis, an opportunity to take an active part in the learning process. He no longer receives teacher-doled-out portions of information in the traditional static passive lecture method, for now he is required to interact continually with the system.

Instructional systems are multi-sensory in that they employ as many of the student's senses as is feasible to maximize learning. In referring to human senses and learning, Silvern (7) indicates all five senses are involved in learning. Approximately 85% of learning is through the visual sense, with 10% through the aural sense and 3% through the tactual sense. The olfactory and gustatory senses are almost negligible, accounting for only 1% each. Realizing that most learning takes place through the eyes and ears, it is easy to understand why most instructional systems employ various combinations of audio-visual media. Research has already shown that audio-visual materials when properly designed and carefully incorporated into an instructional system can motivate and stimulate learning.

The self-instructional nature of systems is another one of their common characteristics. A current trend is to design systems that are independent of teachers as teachers. The value of any system is measured according to its ability to have learners achieve predefined behavioral goals within a reasonable length of time. The more control the system has over the manner in which a learner performs while achieving these behavioral goals, the greater will be its reliability.

Still another characteristic is that instructional systems are self-pacing. A student's rate of progress is determined by his own individual capabilities. He competes with no one; therefore, he proceeds through the system at his own rate. The slower student will take longer to reach his goal, while the more apt student proceeds at a faster rate. He then can proceed to other experiences and is, therefore, not penalized by having to wait for his slower classmates.

In those systems that employ programmed materials, and most do in one form or another, the learner receives immediate feedback containing correct information. This is done to reinforce learning. Another reinforcement to learning is repetitive presentation of the same material through the use of different media. For example, the material to be learned is first presented to the student via cartridge loop film, which can be viewed over and over, and then the same material is again presented in the form of an illustrated programmed book.

Systems are designed to prohibit students from advancing to new material until they have first mastered the current material. Finally, instructional systems facilitate and require learners periodically to self-evaluate their progress.

Instructional systems have been questioned by some educators as being possibly "old wine in new bottles." (8) Admittedly, much of the educational content, especially that in industrial education, has, through necessity, remained unchanged and is indeed "old wine", and certainly educational technology, particularly that which has made use of electronic products, has permitted this "old wine" to be dispensed from "new bottles." Nevertheless, instructional systems do represent something new in education as we shall see when we examine the teacher's and the student's roles in systems.

We have seen that instructional systems employ multi-media to deliver their message. On the surface the idea may appear simple and obvious and to some teachers nothing more than a redescription of what they have been doing for years.

In the past, the teacher who presented his subject matter utilizing a variety of media, which were principally audio-visual materials, was a "teacher with media," that is to say, the media were considered nothing more than "teaching aids" to be utilized or rejected as he saw fit. The "teacher with media" implies a group learning situation which is contrary to the psychology of self-instructional systems. On the other hand, the "teacher within media", as conceived in self-instructional systems, accepts the total teaching function of media and assumes that learning is individualized and that the instructional process is self-sufficient. The teacher, instead of being the sole source of knowledge, the expert in all subjects and purveyor of all information, now becomes an "instructional manager and consultant." Kirkpatrick is anything but kind to the pedagogue when he says "...these self-instructional systems are the complete sources for all training in the subject and for affecting student behavior." (9)

From the available research that has been conducted, we know that properly-designed systems are capable of effective teaching. It would, therefore, seem that for those teachers who insist on remaining "one-man bands," the machine threatens to beat them at their own game; particularly, those teachers in subject matter areas where much of the content deals with laboratory skills such as is carried on in industrial education.

There is always some resistance by certain teachers to new educational innovations, and self-instructional systems are no exception. The negative attitude held by some is based on reasons such as unavailability of appropriate instructional materials, physical conditions inadequate for individualized self-instruction, unreliability of equipment, lack of skill in operating electronic equipment and one that's unadmitted — plain teacher inertia or resistance based on fear manifested in the much-publicized possibility of their being replaced by the "machine." In answer to this fear we can only say that as efficient as machines are, they cannot and never will be able to "inspire, communicate enthusiasm, be completely adaptive and create a desirable social setting" (10) at nearly the level of the human teacher. The teacher within media need not fear replacement, for he is the most important component in systems teaching. It is he who determines the subject matter to be taught, selects the instructional components that go to make up the system, serves as a contributing member to a team of systems design specialists, field tests and evaluates the system, and, if necessary, helps in its modification. On the other hand, we could say for those teachers who fear replacement, any teacher who can be replaced by a machine deserves to be replaced.

Teacher involvement in designing and building instructional systems is most necessary, because responsibility for determining course content rests with him. Besides, we can assume he will be more apt to use instructional materials and media more effectively if he has had an active part in their design. How deeply he will become involved in systems building will obviously depend upon his interest, abilities and available time.

Automated teaching has been criticized on the grounds that it is too impersonalized, inflexible and individualistic. On each of these three issues there is much to be said, both for and against. Regarding these issues, it would seem that when it comes to teaching factual material, the impersonalization of the machine could be a definite asset, for each lesson would present the material in a concise, factual, accurate manner. Systems can be designed to handle basic information, much of which becomes routine and tiresome to teach. Relieved from tasks of this nature, the teacher will have time to engage in course enrichment and evaluation. As to its inflexibility, current trends in systems design are directed toward utilizing components in such a manner that they will permit the learner a choice of media for a given lesson. Regarding their being too individualistic, learning is an individual matter, it always has been, and will continue to be.

We know that each individual learns at a different rate and in a different way, and as Ruark says:

> What we are now coming to understand much more fully is that each learner builds for himself an individual style and individual patterns in the learning act. It is the opportunity to exercise his own individual style and to develop his own individual patterns of learning which are offered to the learner in the multi-media situation....(11)

The answer must finally lie in whether we wish to have improved communication of ideas and efficiency in this communication or continue educating in our present inefficient way.

The student's role in self-instructional systems is also considerably changed. Instructional systems keep him an active participant in the educational process rather than a passive recipient. They should be so designed that they give the learner all necessary information while still inviting discovery on his part.

Traditional educational methodology is "teacher-oriented." Lesson plans, units of study and the like tell the teacher what "he" is going to do; whereas packaged instruction is "student-oriented" in that it tells the "student" what to do. The focus now shifts to the learner and his individual needs.

A basic concept which underlies the use of instructional systems is that the learner will learn better if he is (1) told what he is expected to learn, (2) given a set of learning experiences that help him learn that which is expected and (3) require him to demonstrate his ability to do that which is expected.

Through stated behavioral objectives, the student is told what he is expected to learn. No longer does he have to "guess" what the teacher wants, only to find out later that he guessed wrong. In systems, the responsibility for learning is placed with the student, where it belongs. (12)

Those few magazine articles treating how to build a self-instructional system would lead the reader to believe all that is necessary to produce, let's say, an instructional film, requires nothing more than to load a camera and start exposing film, or that in writing a programmed book all that is necessary is to reduce the operation to a step-by-step procedure; whereas, in reality, the educational and technical complexities involved in building an instructional system demand more than hurried amateurish efforts on the builder's part.

It cost approximately four thousand dollars to develop self-instructional materials for a course in industrial education. Duplication costs run from six hundred to a thousand dollars, depending on the required presentation equipment. (13) Financial investments of this magnitude dictate that considerable time and effort should go into their production. Besides, if we are going to allow the system to do the instructing, how can we possibly accept anything less than a flawless presentation.

Preparation of functional systems is not a part-time chore for the industrial arts teacher but rather a job for a team comprised of sophisticated specialists drawn from many fields. Members of this team include interested teachers (who determine what the system is to teach), evaluation specialists (who help identify behavioral objectives and assist in designing evaluating instruments), media specialists (who function as resource persons and assist in selecting those most effective components that go to make up the system) and administrators (who lend encouragement and support to the entire project).

There are eight steps involved in building and implementing an instructional system. (14)

The first is almost too obvious to state – nevertheless, it is to determine the need, the real need students have and which must be met. An example of a need could be stated as follows: "We need to enrich the course content in industrial arts wood programs" not "we need to make a film so that we can enrich course content in industrial arts wood programs." The latter statement is an instructional component of a system. It might satisfy a need but does nothing in the way of identifying a need; therefore, don't confuse instructional components with needs.

After the need is determined, the next step, and the most important of all, is to identify those objectives which will bring about the desired behavioral changes in students. If the objectives are improperly stated or unattainable, the system cannot and will not guide the learner to the desired behavioral goals. Objectives concerning behavioral changes must be stated in measurable terms – otherwise, there is no way of knowing if the system, as implemented, meets its goals. A sample behavioral change might be stated as: "The student will acquire the capability to identify certain selected domestic softwoods and hardwoods," or "The student will acquire the ability to adjust the radial saw for right-hand miter cutting."

The third step in building a system is recognition of those real-world limiting conditions under which teachers, like anyone else, must operate. Limitations such as existing facilities, available finances, staff limitations and the degree of administrative support will all have a direct bearing on the design of the system and its implementation. Nevertheless, in spite of limitations, the systems design team must hold, at this time, a positive attitude. Modification can be made later if necessary.

The fourth step is to select analytically those instructional components considered to be the most effective in bringing students to an accepted performance level. Selecting components to be packaged into an instructional system requires intelligent, clear-sighted judgment on the part of the team, because each component must be an effective contributor toward attainment of the system's predefined behavioral objectives.

It's not the purpose of this paper to treat in detail individual characteristics of instructional components. Industrial arts instructors are familiar with most; however, there is one audio-visual device whose promise in systems application is worthy of mention, and that is the single-concept loop film. These 8mm films, either black and white, or color, silent or sound, are usually a three-to-five minute presentation treating normally one major (single) concept. The film forms a loop which is contained in a special cartridge, thus permitting repeated showing without rewinding. The simple-to-operate projection equipment is designed for individual or small group use. Manufacturers are marketing a wide variety of loop films treating many subjects. Unfortunately, at the present time, the quantity in woodworking is extremely limited.

After the instructional "hardware" is selected and the "software" built, the next step is to implement the "package." Field testing the system utilizing a pilot population of a suitable size is strongly recommended. This try-out period gives the design team an opportunity to make whatever modifications are necessary. Then, after this is done, the system can be fully employed. (15)

Step number seven is evaluating the system to determine the extent to which the desired behavioral changes are being accomplished. Evaluation instruments such as pre-test, performance test, and post-test are used to establish whether all the objectives were met. Quite probably not all were, which means further changes in the system must be implemented and measured. (16)

As previously noted, the responsibility for learning rests with the student; however, if he fails to arrive at an acceptable level of accomplishment, the fault rests with the system — not with the student. In other words, either the material, teachers or the program is at fault.

The last step is continual refinement directed toward perfection in student attainment of the behavioral objectives.

Emerging out of instructional systems is the need for additional "software." The development of self-teaching films, programmed books and similar instructional materials has not kept pace with the development of teaching machines, projection and recording equipment and other so-called "hardware."

The training of creative, imaginative people to become education system design engineers is another growing need.

A solution to laboratory dust and noise, particularly in the wood area, is still another need. A portable dust- and sound-proof instructional booth large enough to house the tools or machines, instructional components and, of course, the student is one possible answer.

The potential of instructional systems as an added source of revenue for private business has not gone unnoticed. Electronic firms, business machine manufacturers, research associations and publishing houses have merged to form educational subsidiaries with instructional system departments whose purpose is the development of educational systems. General Electric and Time-Life, Inc., formed the General Learning Corporation; IBM is working cooperatively with Science Research Associates; and Xerox and University Microfilm have formed a similar team. Out of mergers such as these, we can expect a growing number of systems will be developed and made available. The subject matter areas in industrial education, while a natural for systems, will probably receive less attention than others; therefore, the industrial arts and vocational subject matter specialists will have to take the initiative in getting systems developed to meet their own instructional needs.

Needless to say, the adoption of an educational technique as radical as that of instructional systems will be costly in both time and money. Their success in industrial education will depend on how well they are received and employed by teachers and administrators.

The promise is there.

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Uniformity in electronics instruction through the audio-tutorial learning system

James L. Boone, Jr.

The interest in a national curriculum in electronics implies that there is a desire for some degree of uniformity in electronics instruction.

One means of attaining uniformity is the audio-tutorial system of instruction. However, the system has many merits that are more important than the mere achievement of uniformity, and the purpose of this paper is to advocate increased use of the system, regardless of the reader's views concerning the need for uniformity or for a national curriculum.

First, just what is the audio-tutorial learning system? Essentially, it is a system that brings the learner and appropriate learning experiences together at an appropriate time, and which permits the learner to pace himself through the experiences by means of guidance and comments recorded on audio tape by an instructor. The system in use at the Texas A&M University Department of Industrial Education consists of a group of learning stations, or carrels. In each learning station are mounted the power supplies, signal sources, voltmeters, oscilloscopes and other instruments necessary for electronics instruction. Also in each station are the materials or electronic components pertinent to a particular week's work.

A specially-designed tape recorder that is mounted in the carrel provides the student with a step-by-step account of the tasks that he is to perform. Recorded by the teacher, the tape usually begins with a statement of objectives for the lesson. The narration often includes a brief review of the previous lesson and explains how that lesson supports the upcoming one. The information is presented in a conversational tone of voice. It is heard by the student through a headphone set. The effect is as if the student were getting personal help from his teacher – hence the name, audio-tutorial. Unlike a tutor, however, the tape recorder has infinite patience, and the student can "ask" it to repeat a statement countless times. Also, the recorder doesn't mind waiting until the student completes an operation (wiring a circuit board, for example) before it tells the student what to do next. After a circuit is wired, the taped voice then guides the student through a circuit analysis involving the oscilloscope and/or other instruments.

Two special controls, "Pause" and "Backspace", give the student complete control over the tape machine. He uses the "Pause" control to still the instuctor's voice while he performs an assigned task. If he does not understand a statement or an instruction, he "backspaces" to hear a phrase again and again until the meaning is clear.

The audio-tutorial system is not new. It was first created in 1961 by Dr. Samuel N. Postlethwait in the Purdue University botany laboratory. Originally, Dr. Postlethwait's intentions were merely to provide a tape-recorded lecture for the benefit of students who missed the regularly-scheduled lecture period. He then conceived the idea of enhancing the taped lecture by providing botanical specimens for the students to observe and manipulate while listening to the tape. When students began cutting class and making up for it by using the taped version, Dr. Postlethwait checked his grade distribution and found that the absentees were doing quite well. This led to the development of his tape-directed laboratory learning stations, which permitted students to participate in learning activities on a self-serve, or cafeteria, basis.

The writer visited the Purdue biological science laboratories in 1964 and 1967. Since botany and electronics are laboratory sciences with a commonality of pedagogical method (demonstrations, experiments, projects, observation, etc.), it seemed logical that the audio-tutorial system could be adapted to electronics instruction. Special learning stations, or booths, were designed and built by graduate students at Texas A&M, and the system was placed in operation at the beginning of the 1968-69 school year. Tapescripts and laboratory activities designed to take full advantage of the audio-tutorial system were developed by the writer. After seven months of operation, it has been found that the electronics students have achieved higher grades and have progressed through the course material faster than during the previous year, when conventional methods were used. Furthermore, each student has become skilled in the use of electronic measuring instruments. This has not always been accomplished in previous semesters, as the weaker students tend to lean on the stronger students, especially when making electrical measurements. The audio-tutorial system eliminates lab partners – each student is on his own.

Is the system expensive? Actually, it is hardly more expensive than a conventionally-taught laboratory, except for the tape recorders. The same electronic equipment is used in both instances – the difference being that the audio-tutorial system requires the instruments to be located in the learning station rather than in a storeroom. This saves considerable wear and tear on the equipment, since it is not moved around. Another factor that reduces expense is the fact that more students can be served by less equipment. At Texas A&M, the learning stations are available forty hours per week. A graduate assistant is present during these hours, and students may use the laboratory at their own convenience. Allowing two hours per student per week, ten stations will serve 200 students. Additional capacity may be realized by opening the laboratory at night.

What are the advantages of audio-tutorial? First, it places the burden of learning on the learner – where it belongs. It gives the teacher an opportunity to perform his true role as manager of a learning environment. It eases make-up work by absentees, since the tapes include instructions for the entire semester. Also, students who anticipate an absence can work ahead.

The use of the headphones allows the student to concentrate. It has been found that other students will not disturb or distract a student who is wearing headphones. The system encourages self-discovery, since the student is working individually, and he is compelled to come up with some answers by himself. The system may use a variety of media, since it can direct the student's attention to actual materials, photographs, slides, filmstrips or single-concept film loops. The system is ideally suited to the general shop because of its self-instructional format.

Space limitations preclude a full accounting of the system here, but the writer is convinced that it is the best method of instruction he has tried. He has no intention of going back to the conventional system. The task at hand is to improve the system through the development of more visual materials, particularly single-concept film loops. It is hoped that other electronics instructors will try the audio-tutorial system of instruction. Additional encouragement and information may be obtained from the writer, or from the Burgess Publishing Company, 426 South Sixth Street, Minneapolis, Minnesota, which publishes audio-tutorial instructional materials in the biological sciences.

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Teacher improvement action: Video-tape and micro-teaching techniques

Henry J. Sredl
Richard L. Nelson

Authors' Note: This presentation was part of the "action" program of the convention and utilized numerous audio-visual materials including video-tape recordings. Since the content of such a presentation does not lend itself to written reproduction, the following represents but a summary of the activities described in the presentation. Individuals interested in further details should contact the authors at the University of Illinois, 344 Education, Urbana, Illinois 61801.

Project background. In September, 1967, the Illinois State Board of Vocational Education and Rehabilitation granted the Department of Vocational and Technical Education, University of Illinois, funds for a pilot study entitled "The Use of Portable Video-Tape Recorders and Micro-teaching Techniques to Improve Instruction in Vocational-Technical Programs in Illinois."[1] As a pilot study, its purpose was fundamentally an exploratory one: The project investigated the feasibility aspects and the various problems encountered in the adaptation of micro-teaching techniques to vocational and technical education.

The pilot study was completed in August, 1968, and from the reports on initial work, as well as from the reaction of the participating school system personnel involved, it seemed essential not only to continue but also to expand the use of micro-teaching techniques and video-tape recordings in vocational and technical education. To this end, Phase II, the current phase of the project, was funded through June, 1969, and is projected to June, 1970. A major effort of Phase II concentrates on measuring and comparing the relative effectiveness of existing programs in vocational education to programs utilizing micro-teaching techniques.

Teaching skills and techniques. Much has been written about teaching, but the exact nature of the art is still elusive. There is agreement that teaching is a complex process with many variables, some of which include personality characteristics, intelligence, motivation, and "teaching" skills or techniques. Studies of teachers and teaching situations have found that teachers use certain skills to evoke responses from students; it is believed that if basic skills or techniques necessary for effective teaching can be identified, then concentration on the development of such skills and techniques can be a focal point of the teacher preparation program. Teaching is thus analyzed in terms of behavior, and, since behavior is a learning process, once we identify the skills and techniques used in *teaching, we can begin to focus on the development of these.*

One of the more promising ways in which to develop teaching skills and techniques is known as micro-teaching. Micro-teaching is real teaching, only scaled down in class size and time. A micro-teaching session usually includes four to six students and a time span of ten to twenty minutes. Such a situation allows the teacher to work on the development of teaching skills in a rather concentrated period of time without the "worry" of facing twenty-five to thirty students in the usual classroom situation.

Video-tape recordings (VTR). A highly desirable supplement to micro-teaching is video-tape recording equipment. Video-tape recordings provide an accurate feedback for a review session and permit self-confrontation by the student teacher in analyzing his performance. This self-analysis is important if the teacher is to continue developing professional skills. When the lesson is seen on a TV monitor instead of in the individual's memory, he is less apt to take constructive criticism personally, since it is his image on the monitor, not he himself, being critiqued. Video-tape recordings should be viewed as a vehicle to implement change.

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Additional project activities. Additional project activities include a national survey attempting to identify current methods of student teaching supervision and evaluation in vocational and technical education. Nationally, 155 schools were questioned, and a response has been received from 139 schools, a return of 88%. In another survey, 61 area vocational centers, junior colleges and technical education schools brought a 92% response. Responses from both surveys are presently being analyzed.

Under development is a series of tapes focusing on individual teaching skills and the development of these skills through micro-teaching. The focus of these tapes will be on seven of the eighteen teaching skills indentified in the beginning studies on micro-teaching at Stanford University by Dr. Dwight W. Allen and his associates in the early 1960's. While they alone will not insure a successful teaching program, VTR's will help focus the teacher's attention on teaching skills and provide an accurate instantaneous feedback to help him improve these skills.

Critiquing by telephone. One limitation on project personnel is that of time; because of the limited time that the university supervisor has with the participating student teachers, video tapes are made and sent to the supervisor for reviewing and critiquing. This system has been refined by arranging a conference telephone discussion of the tape. At the university, the supervisor watches and listens to the tape. Miles away the student teacher and cooperating teacher hear the tape and the supervisor's comments. This is becoming an excellent supplement to the regular supervisory visits.

Messrs. Sredl and Nelson are director and associate director, respectively, of "Improving Instruction in Vocational Technical Education through Portable Video-tape Recorders and Micro-teaching Techniques —Phase II", University of Illinois, Urbana.

Total self-instructional systems in industrial arts

William A. Bakamis

Amid the crackling sounds and hum of the electric welder, a young high school girl of 14 peers intently through the colored lens of her welding helmet as she slowly and methodically moves the electrode across a piece of 1/4-inch steel plate.

In a remote village in Alaska, a heavy-set lad with long black hair attaches the leads of his test equipment to the electrical circuit board. Dials quiver as he deftly makes adjustments and records his "findings" in a workbook.

José Martinez, a 12-year-old Cuban refugee, still struggling to learn the English language, carefully studies the loop film entitled, "Pre-Expansion of Expandable Polystyrene Beads." He stops the Mark IV projector, scratches his head, pushes the start button again and views the film a second and third time. With a look of confidence, he proceeds to the laboratory to begin the task of making a polystyrene ice bucket.

These could be scenes from any industrial arts laboratory or trade school in almost any part of the country. But there is one difference – all three of the students described above are learning basic knowledges and skills in a variety of activities without the presence of a qualified industrial arts teacher.

How is this possible? Through the use of "instant education packages" that Washington State University educators call Total Self-Instructional Systems.

Terms defined. What is a "total" self-instructional system? To define the term we should first define several other terms pertaining to systems.

The term system has a variety of meanings. Educationally speaking, it refers to anything from a comprehensive educational system to a teacher using a combination of media to teach a particular activity.

An instructional system is viewed as a sequence of learning activities where each learner moves at his own pace in order to demonstrate certain behavior which will meet certain defined criteria. Instructional systems focus on the responses that the student makes rather than on the acts the teacher performs. In general, an instructional system is based upon the manner in which a student (individually) learns a specific new behavior rather than upon the way in which a teacher guides a group of students.

A multimedia, self-instructional system uses individualized programmed teaching techniques and devices to permit each student to proceed through the instructional system at his own pace. A *total self-instructional system* is a totally self-contained educational package. In other words, the system is completely responsible for: (1) All the instruction to be imparted in a particular unit; (2) any required laboratory work; (3) the evaluation by the student of his own performance. Evaluation of the student by the teacher may or may not be included in the package. If so, the teacher serves merely as an administrator of the evaluation instrument.

How it all began. The total system development program was launched two years ago with an ESEA Title III Grant to the Anatone (Washington) School District. The project, appropriately named *High School For One*, called for the development of self-instructional systems. To develop these systems, the Anatone School District was able to enlist the assistance of a number of Washington State University educators.

Significant inroads to the problem of providing vocational technical training for thousands of youngsters in "remote and isolated" high schools were made initially by Dale L. Nish in 1966. As a research assistant on a Title 4-C (Vocational Education Act of 1963) grant, Nish developed a polysensory self-instructional system designed to teach knowledges and skills related to polystyrene plastics. (1) This was the first of a series of multi-media self-instructional systems in industrial arts.

About this time, under the auspices of the Northwest Regional Education Laboratory at Portland, Oregon, a cooperative agreement was reached whereby systems developed under the Vocational, Title 4-C Grant would be field-tested in selected rural schools identified in the High School For One Project. During the first year, two other multimedia self-instructional systems were field-tested. These included Edwin K. Hill's system in basic electricity (2) and Harold Sergeant's system on arc welding. (3)

Today, over 1200 students in 15 of these remote but necessary high schools in Washington, Oregon, Idaho, Montana and Alaska are learning about industrial arts by using these systems; and they are doing this without the help of a qualified industrial arts instructor. This may sound crazy but it works. In the Anatone High School, for example, the "teacher" in charge of welding and plastics has been trained as a social science teacher. He has had no training or experience in the industrial arts. In fact, his only contact with shop work was a half-semester course in woodworking while he attended junior high school.

The three systems in industrial arts now in operation in the Northwest are only the beginning. Soon to be a part of the self-instructional programs are courses in concrete technology, drafting, design, and the use of the radial arm saw. The latter is especially important to those in the field of industrial arts because if the forthcoming field tests to be conducted by Professor John Kassay this spring bear out the results of the initial pilot tests made last fall, it will be possible to teach students the operation of an admittedly "dangerous" machine without a fully-qualified instructor doing the teaching. Just imagine the many ramifications such a discovery will have on the profession! Have you considered what implications this would have for the safety of the student?

Bases for system development. Total self-instructional systems are based upon the idea that the teacher should spend his time and talents managing instruction and not in tedious non-permanent preparation. Each system is designed to assist this "instructional manager" by providing him with the materials and procedures necessary to do a more efficient and effective job of teaching. This does not mean that the teacher himself is the imparter of knowledge.

Traditionally, audio-visual materials have been considered as "aids" to instruction. Self-instructional systems have also been placed in this category. The concept of "aids" is even more firmly imbedded in public education.

However, in the last three or four years, things have changed. To refer to multimedia self-instructional systems as "aids" is less than adequate; it is deceptive. *These systems are instruction.* When a school district buys one of these systems it is buying teachers – not "aids".

Instructional materials that make up the system require continual student involvement. Built into the system are programmed "knowledge development" units, laboratory (shop) exercises and experiments, and self-evaluation devices. Every effort is made to utilize the most *effective* and *efficient* instructional strategies for bringing about the desired behavior objectives.

The theoretical basis for the system is essentially programmed learning theory. Modifications have been made on the basis of research on the use of programmed texts in the classroom. The modifications most evident in the development of total systems include:

(1) The changing role of the teacher from an "imparter of knowledge" to that of instructional manager;
(2) The use of a variety of instructional strategies;
(3) The use of a wide variety of instructional hardware; and
(4) The use of "micro-concept" approach.

The micro-concept is vital in system development. This means that single concepts must be broken down into sub-concepts or micro-concepts, each of which is related to the whole or larger concept. By presenting the instructional material in these small sequential steps and by following the principle of continuity with each step, the terminal behavior which each student is expected to manifest can be accomplished quickly and effectively. This approach is used in systems dealing with the development of skills as well as in those designed primarily for imparting of knowledge.

System development procedures. The development of systems for the rural schools involved a seven-step procedure:

(1) The problem area had to be defined.
(2) A review of pertinent literature bearing on the subject to be "systematized" was made.
(3) The instructional system was designed.
(4) A prototype of the system was produced.
(5) The system was field-tested in 3 or 4 selected schools.
(6) The system was redesigned based on field test data.
(7) An adequate number of systems was produced for demonstration purposes.

At this point the Northwest Regional Educational Laboratory arranged for demonstration of the system at several selected schools and aided these and other interested schools in the adoption and installation of the system.

How the system functions. The instructional systems in industrial arts have been designed to be used in individual mode by students at their own rates. As such, these self-paced systems alter the role of the teacher from that in group mode utilization.

Each industrial arts system currently in use functions differently. The role of the "teacher", however, remains basically the same. His only functions are: To assign and schedule students for each specific system; to instruct in the use and care of the AV equipment they will be operating; and to refer them to the various instructional materials used. Obviously, a highly-sophisticated system could be developed that would take away even these responsibilities from the teacher.

The arc welding and plastic systems are aimed at developing psychomotor skills. The welding system emphasizes the three basic operations, while the plastic system concentrates on the procedures involved in making selected household items from polystyrene beads. Each system has specific objectives directed at the development of student cognition relative to certain aspects of arc welding and plastics.

In both systems the instructional strategies are basically the same.

After viewing a commercially-prepared film which serves as an orientation to the particular subject area, the student is directed to view a short (3-1/2- to 5-minute) audio-loop film on the sub-task performed.

When the student completes the viewing process, he is instructed to complete the programmed instruction book that accompanies the audio-loop film. This programmed instruction book requires overt responses to questions that review the material presented in the audio-loop film.

The plastic system utilizes the branching system, while the welding system is linear.

Students may view the audio-loop film as many times as they desire. The short duration of film eliminates boredom by getting student involvement quickly and at regular intervals.

Upon satisfactory completion of the programmed instruction book, the student is directed to the laboratory to perform the particular task demonstrated in the audio-loop film. If, while performing the task of, let's say, "running a bead," he encounters difficulties, he can view the film again and again, if necessary, to discover his error.

When the first task is completed, the student is directed to the next audio-loop film. The procedure for the second and subsequent sub-tasks is much the same as the first. Both systems employ the same basic step-by-step procedures.

Feedback is vital to a good system. The systems described here employ two methods of feedback. The first type is in written form, that is, providing answers to questions in the programmed instruction book. A second method employs the use of comparative models or photographs of items, sub-tasks or finished projects. For example, the welding system employs a panel mounted with samples of good and poor beads. In evaluating his work, the student compares his results with a correct model along with several models representing the most common errors. Models representing the most common errors have an explanation of the causal factor of each. Thus, the student is provided the feedback that is so essential in instructional systems.

The system developed for teaching basic electricity involves a different instructional strategy than the systems mentioned above. Objectives for the system are primarily cognitive in nature. Included in the system are units on electron flow, conductors, resistors and basic circuitry. Manipulative experiences are minimal and include only those skills required in the use of meters and in a number of assembly tasks to be performed on a "circuit board" which is provided with the system.

Instruction in this system is presented by means of 35mm color slides synchronized with loop-audio tape. A carousel slide projector and audian are housed in a specially-designed console which provides for rear screen projection.

(It may be well to point out that six months following the design and construction of the console unit, a commercial firm in Bellevue, Washington, developed the Audi-scan, which performs the same basic functions as the console we developed at Washington State University.)

Programmed into the basic electricity system are small-step sequences requiring overt responses. A sensing tape stops the oral and written instruction to permit students to respond to questions or to carry out a particular assembly task on the circuit board. As soon as the student completes his task or solves a particular problem, he pushes the "start" button on the console. Feedback is immediate and is given orally and visually.

The basic electricity system is presented in linear form. However, in developing the instructional objectives for this system, it was clearly evident, immediately, that some degree of competency in mathematics was required to attain the stated behavior objectives. This necessitated the development of a sub-system in mathematics – one that complemented the major system but did not dominate it.

Through the system and sub-system, the student not only acquires the necessary mathematics competency, but also continuity in the major electronic system is maintained.

Implications. The three systems I have described are but samples of the types of instruction that could be presented using this approach. Others could be developed on practically any subject. The only limitation that I can see in the implementation of instructional system lies in the imagination of the system designer.

This is a time of massive educational innovation. Throughout the country more and more colleges and universities are experimenting with new programs, techniques and approaches to teaching and learning. Systems seems to be the magic word in many of the research proposals being submitted to state and national education agencies. Even the publishing firms are taking a second look at developments in this field. Some of the results in this area have been noteworthy. Others are ineffective and will never get off the ground.

Although our efforts at Washington State University were primarily concerned with the development of systems for rural schools, it is clearly evident that these systems will have far-reaching implications for not only those of us in vocational-technical and related fields, but also in all fields concerned with instruction.

Here are some things that are taking place or may take place as a result of our first efforts in this field:

(1) More and more urban schools will soon be using systems. At the present time, two urban schools in the Northwest are using them. Others have inquired about their availability.
(2) We have been advised that the Navy will begin using the welding systems developed at Washington State University this fall.
(3) As more and more schools, especially rural schools, ask for systems, the education agencies or commercial firms will start producing them.
(4) Inner-city leaders in industrial arts are asking universities to train systems designers.
(5) Individual teachers are attempting to develop systems. (Unfortunately, many of these teachers have neither the training, experience or the facilities to develop sophisticated systems.)

In summary let me state again: Total multi-media self-instructional systems work. The proof of the pudding lies with those teachers and students who have been involved with the systems.

We do not claim that these systems are ultimate or final in any sense of the word. We know they lack sophistication. (We didn't have the writers, programmers, artists, cameramen, editors and the like.) In spite of these limitations, we developed systems and we got results. The student learned.

Total self-instructional systems are here to stay. They teach. They do not replace the teacher, but they will no doubt change his role drastically. How much? In which way? Only through continued research in this field will we find these answers.

You, as teachers, cannot be expected to keep up with our rapidly-expanding industrial technology. You will be called upon to teach more and more technology to more and more students, not fewer. The magic number of 24 students in a class has already become a myth. There is no doubt in my mind that we will have to come up with new innovations to do the job of educating our youth. Total self-instructional systems may be one of the ways in which we can meet this challenge.

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Educational and facility planning for middle schools

Harry L. Polley

We are living in an age of constant change. This is an interesting and challenging time to be associated with education. We must be willing to change – we must be willing to make a few mistakes. We must not be afraid of failure.

Education has changed more in the last ten years than in the preceding fifty. Five and ten years from now we will be using equipment and teaching programs that are not even thought of today.

Why, just to keep abreast of the new terminology takes about one day per week of a planner's time. Then when we think of the new technological improvements, Wow!

Programs must change. There is a new number in education today, and the number is one. We must now turn our attention from the classroom of 25-30 to the individual student, his program, his activities and his environment. Individualization of instruction is here – we must get with it. Team-teaching, non-graded-program learning, teaching machines, TV for teacher self-improvement, electronic labs of all kinds, audio-visual equipment, computers, data processing, modular scheduling and dial-o-matic systems – are just a few innovations that we must consider.

Middle school facilities should be designed specifically for the changes which the unknown educational future will bring. The building must help to create an atmosphere which encourages teachers to be flexible and to adapt and to make use of worthwhile education innovations. In the middle schools, the teachers should no longer have to concern themselves with arranging students to suit an inflexible building, but instead will continually rearrange the building to suit the needs of the students.

In addition to flexible buildings, the middle school must have flexible teachers. These teachers need to understand that the most efficient and effective student learning takes place in groups of varying sizes and from a variety of sources in addition to the teacher.

Knowing this, the middle school teachers must work together in teaching teams with individualization of instruction for each student as their goal.

The program of the middle school must be flexible and incorporate a variety of alternative courses as well as the technical flexibility in scheduling which will enable the curriculum to be redesigned to suit the varying growth rates, interests and abilities of each student. Because of its central role in the individualization of instruction, the focal point of the entire middle school program will be the instructional materials center. Learning in the middle schools will become an exciting and meaningful adventure in which the student gradually assumes an increasingly greater self-directive role.

The students arrive at the middle schools after an elementary school concentration on basic skills, and the middle schools are faced with the task of developing the use of those skills in the acquisition of knowledge and the development of human and social relationships. At the same time, the middle school should depart radically from those elements of the present junior high school which contribute to early sophistication and its undesirable by-products. In a sense, the middle school has a transition function as the middle unit of a public school education, but it must never accomplish this transition by adopting the characteristics of a high school.

If the middle school idea had to be summarized in one word, that word would be "opportunity." The middle schools are an opportunity for a staff of educators and a group of students to achieve today the schools of tomorrow.

Sixth-grade teachers should be organized on a comprehensive team teaching basis which enables all teachers to teach all of the basic subjects. At the same time, the sixth-grade teams should be formed so that individual subject matter strengths and interests complement each other. In addition to the basic sixth-grade teams, specialists in the areas of foreign language, unified arts, physical education, typing, music and guidance need to be provided. The extensive use of such educational specialists at the sixth-grade level is possible under the new middle school organization and provides an opportunity for depth and breadth never before possible when sixth-graders were housed in each of the elementary schools.

Seventh- and eighth-grade teachers are organized on a subject matter team teaching basis, where a team of teachers handles all seventh- and eighth-grade students in a particular subject matter. Depending upon the enrollment, English teams contain four teachers, and the mathematics, social science and science teams contain three teachers each. Foreign language, unified arts, physical education, typing, music and guidance are also an integral part of the seventh- and eighth-grade curriculum.

First of all, many people have asked the question: Why did you name your intermediate units "middle schools"? Such a question always gives us the opportunity to renew the rationale which has been developed over a three-year period. This would indicate immediately that the "middle school" is not a building but a philosophy.

The 6-3-3 organization which exists in most school districts includes the traditional junior high school. For many reasons the ninth-grader is much too old and much too sophisticated to be well-adjusted in this type of intermediate unit. Thus, he and his teachers brought about changes which caused the junior high school to become an exact copy of the high school. Gradually, this school became less and less satisfactory for the seventh- and eighth-grader.

We believe the ninth-grade student of today belongs with older students. There is presently a marked tendency to retain or restore the four-year high school for purely education reasons. At the same time, recent research indicates that the earlier maturation of children dictates a regrouping of upper elementary grades. Thus, the sixth-grader from the old organizational pattern now seems to fit more closely with the seventh- and eighth-grader of the middle school.

Still another consideration with which school and community leaders are faced as they plan future organizational changes is that of early social development of many junior-high-aged youngsters. The middle school, encompassing grades 6, 7 and 8, appears to give the best solution for slowing down this situation.

Generally, the educational plan designed to meet the needs of the middle school student is one that places the emphasis on the individual. In part, this is accomplished through counseling, through the use of various-sized teaching groups, through the various lengths of teaching time, and through a wider range of experiences.

Schedules in each school should vary according to the needs and growth of the students. Included in the student's day should be academic instruction by teachers, instruction in related arts, and student-structured time. Teachers also need team planning time included in their schedules. Much flexibility is to be derived from such a scheduling arrangement.

The grouping and regrouping of students may be on the basis of achievement or for any other purpose as determined by the need at a given time.

Independent study will consume more and more of the individual's time as this concept becomes familiar to both teacher and student.

In addition to the basic sixth-grade subjects, foreign language, unified arts (art, home economics and industrial arts), physical education, typing, music and guidance should be provided under the direction of specialists in these areas.

Seventh- and eighth-grade teachers should be organized on a subject matter team teaching basis, where a team of teachers handles all students in a particular discipline. Here we should also make note that the use of student teachers has proved effective through team teaching and individualized instruction; also, that during the school day, time should be made available for teachers to plan in the teacher planning area.

In each middle school, the instructional material center (formerly referred to as the library) should be the hub of the building, with the learning centers (classrooms) surrounding it. Students should constantly flow through the center, bringing them into direct contact with books and learning devices.

Provisions should be made for the middle school student to pursue his work individually in the privacy of a study carrel or with various-sized groups at study tables. In each center, there should be easy-type chairs provided for leisure reading and discussions.

May I close by summarizing what to me seem to be the advantages of the middle school organization and program:

(I) The middle school seems to cater to a student body more homogeneous in psychological and physiological character. Margaret Mead has commented on the inappropriateness of the traditional junior high school grouping in terms of maturation. Studies of the social, emotional and physical differences among children find close similarities between students in grades 6 and 7 and also grades 9 and 10; the middle school does not separate these grades as does the junior high school.

(II) The middle school allows for an expanded curriculum one year earlier. For reasons yet unknown, children are reaching adolescence somewhat younger than in the past. Many courses traditionally reserved for the high school grades are now being taught earlier, and 6th-graders are ready for the excitement and challenge of an expanded school curriculum, according to the proponents of the middle school. It should be pointed out, however, that the general "pushing down" of subject matter is not necessarily a good thing and could well be the most forceful argument against the middle school unless the movement of subject matter down into the grades is accompanied by changes to methods appropriate to youth at an earlier age. In short, the content and methods of the junior high should not be transplanted per se.

(III) The middle school is free of the Carnegie Unit (the unit of measure that indicates high school preparation for college), since the 9th grade is shifted into the high school. With this relief, the middle school has no pressure to prepare an impressive transcript for college entrance. In the opinion of many educators, this change is the strongest case for the middle school, because it removes many of the influences of the secondary school; the middle school is not a junior anything and is free to experiment with non-graded schools, flexible scheduling, ungraded course-work, individual teaching, resource centers and all of the other theories which too often have been abandoned in favor of traditional methods which result in transcripts for college. (As a side effect, the four-year high school is able to prepare a more meaningful college entrance sequence and report it on a well-coordinated transcript.)

(IV) Because no 9th grade is included, the middle school has the opportunity to avoid many of the social activities and school affairs which are associated with high school life. Close scrutiny can be given to marching bands, inter-scholastic sports, dances and similar activities before they are sanctioned as part of the program.

(V) The middle school provides a smoother transition from the practices of the elementary grades to those of the high school. In many instances students start their middle school careers in self-contained classrooms which are under the direction of one teacher, although this teacher's work is augmented by assistance from the specialists in science, mathematics, foreign language and the arts.

The more departmentalized offerings of separate subjects in separate facilities are reserved for the upper-middle school grades and are introduced in increasing amounts. Thus, students enter in the elementary school atmosphere and leave in one similar to that of the high school.

(VI) *There are several administrative opportunities which arise whenever there is a shift of grades within school organizations.* In many local situations, the middle school might be installed in order to deal with such problems as crowded buildings, *de facto* segregation, over-loaded bus schedules or addition of kindergartens. However, if the shift to the middle school is made for these administrative reasons, the real reasons should be honestly declared.

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teacher education

The junior college and industrial education teacher preparation

John Feirer

The greatest single influence on the programs of teacher preparation in industrial education in the years ahead is the present-day, fantastic growth in technical programs in community-junior colleges throughout the country. No one can possibly predict exactly how this growth will change the quality and quantity of teachers produced. However, the effects of this growth cannot be ignored by those responsible for planning future programs of industrial teacher education.

If there are to be good programs in industrial, vocational and technical education, there must also be qualified teachers. In past years, these teachers have come from two primary sources. One source was undergraduate programs of industrial teacher education, in which students began as freshmen and completed a four-year bachelor's degree program to prepare for teaching industrial arts in junior or senior high schools. The second was the selection of qualified craftsmen to become T&I teachers. These craftsmen were given certain professional courses in educational technology with a view toward making them adequate and qualified teachers of trade subjects.

Today, a new element has been added that will revolutionize teacher preparation programs; this element, of course, is the fantastic growth of our community-junior colleges. With this growth must come changes in programs in the four-year degree-granting institutions. More and more freshman and sophomore students will enter community-junior colleges to prepare for the world of work. Most of those students who enter technical programs will have a two-year associate degree as their original objective. However, as students are successful in both academic and technical courses, they will become more aware of career opportunities that require a four-year degree program. It will be from this source that the great majority of industrial, vocational and technical teachers will come.

Because of this change in the first two years of college preparation, the four-year degree-granting institutions must adjust to a new teacher preparation program and a new source of teachers. More and more of the four-year institutions will become mainly upper-undergraduate and graduate schools. In certain states, particularly Florida, the new universities are upper-undergraduate institutions with only base preparation given in the community-junior colleges. All students, therefore, are transfer students.

How will this affect the kind and number of industrial teachers prepared? These are questions for which there are no easy answers. However, guidelines must be established if there is to be an orderly and realistic transition from the old to the new ways of preparing industrial arts, trade and industrial-technical teachers. It is with these problems that this study is concerned.

No one can predict precisely what changes are needed and how they should come about. However, until there is an organized, orderly approach, solutions will be fragmented and will be based, all too often, on the individual judgments of department heads or deans of admission in four-year degree-granting institutions.

Since adequate teacher preparation is the most critical problem in the future of industrial programs, there must be serious thought given to the guidelines needed for cooperative action between community-junior colleges and four-year institutions. This is not a one-sided problem. It cannot be dictated by the requirements for the four-year institutions, nor can it be unduly influenced by the needs for two-year technical programs in the junior colleges. In most instances, technical programs in junior colleges are rightfully designed for students who do not intend to finish a baccalaureate degree. Most of these programs have been designed to prepare the student for the role of technician in an industrial society. The fact that a portion of students will terminate their education with the associate degree does not lessen the responsibility of leaders in junior colleges and four-year institutions for cooperative action in the preparation of industrial teachers.

There is no easy answer to many of the problems that exist. Obviously, if a teacher preparation program is to be built largely on the technical offerings of the community junior college, the technical preparation of teachers will be dictated, to a large degree, by the technical offerings of the community-junior college. Programs of this type will be unable to supply the profession with general industrial arts teachers, for example. Also, there will be big gaps in the kinds of teachers prepared. For example, the junior college with no graphic arts facilities cannot hope to turn out teachers who wish to specialize in this area. It will also be true that the kind and quality of teachers will vary with the geographic location of the four-year degree-granting institution and with the location of the junior college. Junior colleges in and around large metropolitan areas will, in general, provide a larger variety of programs and greater depth of offerings. Those in the suburban and rural areas will suffer greater limitations in variety and depth of offerings. Since students usually transfer to four-year institutions from junior colleges in close proximity to the senior institution, there may be a different kind of teacher prepared in the less populous areas than in the areas with large concentrations of population.

The growth of community-junior colleges will also have a significant effect upon the four-year industrial education programs. In some cases, universities may decide that it is not economically feasible to provide laboratories which may duplicate those available in junior colleges. For economic reasons, four-year institutions may eliminate laboratory facilities altogether with a view toward offering prospective teachers only professional education courses. Certainly, the teacher who has been cooperatively trained by both the junior college and four-year institution would not, in many cases, be qualified to teach general industrial arts. As a result, questions may be raised as to which institution should be responsible for preparing general industrial arts teachers for the junior high school.

This entire problem is complicated by the rapid change in the community-junior college movement as a whole. Not only is there a dramatic increase in the number of junior colleges but also in the kinds of technical offerings. One has only to look at research completed in 1964-65 to find that, in the intervening three or four years, growth in the number of junior colleges in many states has been as high as 100%. Since this rapid growth will continue, no specific agreements made today could apply five to ten years hence. However, if there is to be an orderly transition, guidelines must be established now. Without them, a chaotic situation will develop in many states experiencing the rapid growth of junior colleges.

This study is presented not as a panacea for immediate ills or long-term growing pains. It is presented in recognition of problems that need to be solved and of the efforts being made by the extremely capable people from state departments, community-junior colleges, and four-year degree-granting institutions who are joining forces in outlining possible solutions. There is nothing more certain than change, and there is no educational area in which this is more dramatically highlighted than in the growth of two-year colleges. Only when these institutions cooperate fully with the four-year institutions will there be an orderly transition in the ways and procedures for preparing industrial teachers. Four-year institutions must, in turn, recognize the fact that two-year colleges were not established as transfer institutions, particularly in the technical education areas. However, institutions must also recognize that, as students in technical programs find success, their horizons broaden. As students succeed in college who originally did not intend to complete a four-year degree program, they must be given an opportunity to complete a four-year degree. While some of these students may wish to enter engineering and industrial technology, there must also be encouragement given to those who want to go on to become industrial education teachers.

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In-service industrial arts education for elementary teachers

William R. Hoots, Jr.

The largest single problem facing the implementation of the Bertie County Elementary Industrial Arts project was that of teacher preparation. The project was planned on the assumption that elementary classroom teachers can be prepared to conduct industrial arts activities in their classrooms. Provisions for this consisted of in-service education and close assistance by curriculum coordinators.

Before looking at the teacher education portion of the program in detail, an understanding of the background of the teachers is necessary in order for one to understand the problem of in-service education. Bertie County is an extremely poor county, ranking 69th in North Carolina, while North Carolina ranks 43rd in the nation. It is a rural county with very little potential for economic improvement through agriculture.

Teachers. Most of the teachers in the Bertie County Schools are natives of the county and come from the same kind of environment as their pupils. Many of the teachers associated with the industrial arts project are Negro and have been educated in southern Negro institutions which tend to provide an inferior preparation for teaching. Also, many of the teachers have been teaching for a number of years and have had little additional formal education.

The Elementary Industrial Arts project, being a Federally-subsidized endeavor, provided funds to pay teachers for time spent in in-service education, an opportunity for obtaining additional income. This was probably the strongest factor influencing teachers to work with the project. Many of the teachers, especially by the end of the in-service education period, were very enthusiastic about the project and were involved wholeheartedly in it; there were others, however, who seemed to be interested only in putting in the necessary time to earn their stipend. Also, at the beginning of the program the participants revealed a degree of apprehension associated with a fear that they would not be able to handle the tools and equipment that were involved. This was quickly overcome, however, and most of the participants became reasonably proficient in all activities.

These attitudes did have a considerable bearing on the program. There was a strong reluctance on the part of most participants to spend any time outside of class preparing for activities connected with the in-service program. These activities had a tendency to dictate the type of instruction that was offered and considerably limited the benefits that could be provided by the instruction.

In-service. The formal in-service preparation for teachers consisted of two courses in elementary industrial arts, both of which carried three quarter-hours of graduate credit and consisted of a total of fifty clock hours of instruction. An extra incentive for participation was the credit which was applied to certificate renewal and appropriate for Master's degree credit for those needing it.

The first of the two courses was a lecture-laboratory course in which the basic philosophy of elementary industrial arts was developed and in which teachers were helped to learn some of the basic techniques of using tools and materials appropriate for use in the elementary classroom. This course met for five hours a day for ten days, and each day consisted of a one-hour lecture-discussion period and a four-hour laboratory period. The lecture-discussion period covered such topics as the Philosophy of Elementary Industrial Arts, Trends of Industrial Arts for the Elementary Grades, and methods of using this subject at the elementary level. The laboratory portion of the course was primarily aimed at developing manipulative skills with the tools and materials necessary for conducting industrial arts activities suitable for use in elementary classes. Each teacher planned a unit of industrial arts work, coordinated with other subjects being studied, and performed all of the manipulative experiences required for that unit.

The second course was a three-quarter-hour lecture course taught during the early part of the school year. The class met one evening per week for three hours for a period of ten weeks. It included a continuation of the philosophical considerations in the previous course as well as further development in the refinement of units of study appropriate to the elementary grades. Such topics as the values of elementary industrial arts, objectives of elementary industrial arts, methods of teaching industrial arts in the elementary classroom, methods of organizing, planning and conducting a field trip, and methods of utilizing audio-visual devices were studied and discussed. In addition, each teacher planned and carried out several teaching units, and, in many cases, these teaching units were carried out in the classroom during the time of the in-service program.

The in-service teacher education for the elementary industrial arts program did not and could not end with the completion of the two formal courses. These two courses provided a basic foundation upon which further refinement was required. It was found that it was necessary for an industrial arts specialist, a curriculum coordinator, to work hand-in-hand with the teachers throughout the remainder of the year. It had been hoped that the teachers could be gradually encouraged to work on their own, but this has been slow in coming. It is assumed that the teachers have not yet developed the security necessary for independent work. However, as teachers become more and more secure they have had a tendency to work without the aid of the coordinators, and it is expected that during the second year these teachers will require less help.

Conclusions. It must be concluded that the most difficult problem of implementing a project such as the Bertie County Elementary Industrial Arts project is that of teacher education. It also must be recognized that this is the weakest point of the entire program, and that the program can be no stronger than the teacher who conducts it. It has been learned that teachers participating in this kind of an activity must be thoroughly prepared and that success will be highly correlated with the quality and quantity of teacher preparation.

Ideally, more preparation should be provided for teachers before they begin work with the children. It would be highly desirable if all elementary teachers could have preservice training at the undergraduate level and that they would know something about industrial arts when they first begin their teaching career. Other possible alternatives include long-term summer programs conducted in the community or in an institution of higher education. There are plans for twenty-four of the teachers for the second-year phase of the project to attend an EPDA Institute for a period of eight weeks during the summer of 1969. It is expected that this long-term intensified and comprehensive program will make these teachers considerably more competent in conducting their activities in the classroom. Not only will the teachers in this Institute get more instruction in industrial arts, but also they will receive instruction in the psychology of the disadvantaged child and sociology of the rural area.

Second-year teachers not attending the Institute will be provided a three-week program at one of the local schools. This program will be very similar to the instruction that was given to the first-year teachers except that it will all be taught in the summer and there will be no formal in-service instruction during the school year.

No specific conclusions can yet be drawn as to whether or not elementary teachers can be prepared to conduct industrial arts activities without an unreasonable amount of extra preparation. Teachers involved in this program were left more highly-motivated than one would expect teachers to be in this kind of situation, and their educational and sociological backgrounds are somewhat deprived. But in spite of these limitations, there is evidence to indicate that it should be possible to prepare these teachers to conduct industrial arts activities in the elementary grades. In-service education is the answer to the problem, and much research and experimentation are needed before the best solution will be found. If the children of Bertie County, North Carolina, or of the entire United States, are to receive an education which will prepare them to become effective citizens in this modern-technology society, to select and enter an occupation which will be personally satisfying to each individual, and to enjoy the full satisfaction of all that modern technology has to offer them, we must devise ways and means in the modern educational system of teaching and preparing these children for such a life. Industrial arts is one of the answers, and we must find ways by which we can make this vital phase of education available to all youth in all parts of this nation.

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vocational education

The role of industrial arts in a total educational program

Arthur J. Dudley

Through the years there has been a long-standing "feud" between industrial arts and occupational education personnel which I submit has been generated by a lack of defined purpose for the two services.

If we are to resolve this condition for mutual action, we must define our respective purposes. All of us can agree that many state and local programs had industrial arts education serving both general and vocational purposes. At this point I believe we should quit arguing about this past approach – for it is a thing of the past since PL 88-210 was passed, changing the entire focus of vocational or occupational education (i.e., the switch from funding for occupations purposes, such as machine shop practice, auto mechanics, etc., to a prime focus on the needs of groups and, more recently, in the 1968 amendments, a focus on the needs of certain kinds of individuals).

If we can take off from this point, it would appear logical to state a goal or purpose for each service. Such a goal or purpose should be distinctive for each service. Such a goal or purpose should be distinctive for each to establish an identity and to indicate a general direction that is reasonable and clear to educator and layman alike.

In both instances, referring to occupational education and industrial arts education, we are mutually concerned with technology, its interpretation and implementation. It is here that we need to stand back and look at the educational scene from a truly broad perspective. This view should encompass the major realms of curricular effort; namely, the sciences, the humanities and the technologies. I submit there must be a balance among these three if we are to achieve any relevance or realism for the youth of today and tomorrow.

We can agree that the sciences, both natural and social, represent a body of knowledge and experience that is important to our society. We also can appraise the contribution of the humanities to the educational mainstream. It is within the third realm of the technologies that industrial arts, along with occupational education, can assume a rightful role. It would seem that within the realm of technology we might find a common denominator with occupational education.

If we deny this commonality then we have nothing in common and should go our separate ways. However, let us agree that there is a common denominator in relating to technology for our content, experiences and methodology.

Based on the preceding, I believe we must direct attention to curriculum, methodology, facilities, staff and pupils served to identify the role of industrial arts in the total scheme of things. As a means of organizing our thinking, I would suggest that we first direct our attention to the matter of purpose and policy which would encompass identification of a goal, the major aims and the instructional objectives with a goal being the prime purpose of the curricular offering, aims being more definitive statements of purpose and, finally, objectives being those behavioral outcomes that can be measured specifically at the instructional level. You may not accept this hierarchy of terminology but I submit it as a starting point to establish a framework for the development of mutual statements of purpose. I do not propose that we develop the same goals for both services, because I believe that industrial arts has an identity. I further believe that occupational education has an identity.

Let me move on to another major sector; namely, the development of a curricular design, this design to be another facet of the sharpening of our role in the total scheme of education. First, it would be logical to establish the elements that are to be considered – consumer knowledge, skill development, appreciations, understandings, etc.

The continuation of this design would require that a determination be made of the extent to which the domains of learning are emphasized. The relative emphasis that is placed on the cognitive aspects, the affective area, as well as the psychomotor involvement, will determine content direction, methodology, staff – yes – even the number and type of facilities. And a final factor in a curricular design is the determination of the levels of learners to be served.

The procedures mentioned up to this point have been a prelude to the organization and implementation phase which all and each of us must ultimately face.

If in our search for mutual action between industrial arts and occupational education, both parties have established a purpose and policy, followed with a curricular design, then each is in a position to move to a plan of organization and implementation, this latter phase to encompass courses, facilities and staff.

As I have progressed with my comments, I am sure that many of you are restive because of the lack of prescription. This is deliberate on my part for I believe our attention needs to be focused on a plan of action rather than on becoming immersed in detail if there is to be any material accomplishment.

In conclusion, let me share with you a review of the entire picture I have attempted to portray. At this point there are minor semantics in need of attention. However, let us take a look at the purpose, direction and implementation implied in the following outline:

PROGRAM RELATIONSHIPS

Industrial Arts Education

MISSION - Interpret Industrial Technology
GOAL - Technological Adaptability
ORIENTATION - General Education
    Breadth of Instruction
LOCATION - Home, School
LEVEL - Grades K-12, Continuing
CURRICULUM - Student Activity/Technology-Centered Content
PROGRAM - K-4 - Nature of Work
    5-6 - Introduction to Tools
    7-8 - Examination of Materials and Forces
    9-12 - Orientation to Industry
    Cont. - Extension of Abilities
SERVICE - K-6 - All Girls and Boys
    7-8 - All Boys
    9-12 - Elective
FACILITIES - General Shops

Occupational Education

MISSION - Provide Salable Skills
GOAL - Entry-Level Employment
ORIENTATION - Specialized Education
    Depth of Instruction
LOCATION - Area Occupational Center
LEVEL - Grades (10) 11-12, Continuing
CURRICULUM - Skills Development/Job Analysis Content
PROGRAM - Secondary - Service Occupations
    Skilled Trades
    Technical Occupations
    Continuing - Refinement of Skills
    Retraining
SERVICE - Youth with Occupational Commitment
    Youth with Special Needs
    Unemployed
    Underemployed
FACILITIES - Specialized Shops, Labs, Rooms

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The relationship between industrial arts and trade and industrial education at the secondary level

William T. Kelly

To be true to my topic, I found it necessary to check both the dictionary and my daily responsibilities for decision-making. In the dictionary I found dilemma described as: "faced with a choice between equally unfavorable or disagreeable alternatives, or as a perplexing or awkward situation." The first I refute as not being applicable, but "perplexing and awkward situations" are almost a daily occurrence. To understand why, it is necessary to reflect for a minute concerning the importance of "education" in our society. The general population has had a vision and a conviction that places a high value on "education". More people than ever before are striving to acquire an education, but at the same time more and more people are becoming critical of the effectiveness of some of our educational philosophies, programs and activities.

Questions are being raised in the market place in evaluation of our educational achievements. We in industrial arts and vocational education are receiving a share of this critical examination. Perceptive lay persons are asking such questions as:

(1) Honestly, can you tell me what is the difference between industrial arts and vocational education?

(2) How does career development differ from industrial arts or vocational education?

(3) What about the vast number of technological world-of-work learning experiences not included in industrial arts? Occupations in the health, business, home-related and service fields – whose responsibility are they if not yours?

(4) What about dropouts? Why has industrial arts or vocational education failed to them?

(5) Are industrial education programs realistic? Have teachers and curriculum planners faced up to pupil and community needs as they exist? Why are there so many job areas for which the schools do not offer learning opportunities?

I am sure that you too are sharing similar experiences with people who are questioning and evaluating an educational system which permits or encourages dropouts or that graduates students without adequate knowledge, understanding, and skills that are relevant to their needs and those of society.

How do you adequately answer these questions?

President Johnson in his educational message to Congress on February 5, 1968, said:

> "A high school diploma should not be a ticket to frustration. - - - We must build stronger links between the schools and their students and local industries and employment services so that education will have a direct relationship to the world the graduating student enters."

You will no doubt agree that no phase of life can be more difficult than the transition from childhood to adulthood. In recognition of this difficulty, society has placed upon the schools the responsibility for building an effective and reliable bridge linking youth and adult life. For us it is significant that the President's Advisory Committee published its report under the sub-title Vocational Education – The Bridge Between Man and His Work.

Improved technology and communication has brought an awareness to nearly all people of the infinite possibilities for expanded living in our current society. It is an awareness that is creating sharply-rising expectations within all of us. If our modern technology cannot provide individuals with the wherewithall to achieve a reasonable number of these expectations, then we can expect an increasing growth of revolutions – revolutions born of frustrations. One aspect of this activity is found in urban centers as they face a new major force in the movement toward school decentralization or community control, call it what you may, which creates many new perplexing problems. Community representatives are quite outspoken and insistant concerning what they believe to be the real needs of their children and the types of programs they feel will most effectively meet these needs.

I can say to you, from actual experience, that these community representatives raise serious questions concerning industrial arts and vocational education programs. Although these community groups share the same doubts about our programs, they frequently insist upon replacing them with divergent alternatives. They want and are going to get a piece of the action, involving decisions concerning program offerings, content, methods and teachers. As an administrator, I face perplexing problems in these new challenges, but for some teachers of industrial education it may pose a choice between change or failure. When the local community gains control over an old school, or of the planning for a new one, it's too late for us to tell them we are or were just going to update a program.

Have you had experience with program-planned budgets? It is an important management tool applied to educational decision-making. But the application in an urban system can be awkward and perplexing. The allocation of management resources applied to the school district budget can mean many things. Let me illustrate. Suppose the administration of the urban center were to be placed in the hands of ten area superintendents, each to be given an equitable share of the urban educational budget and full responsibility to allocate the funds to purchase the services which he deems important for his community. Thus he decides what programs to expand, contract or close out. So what about industrial arts and vocational education? In his position how would you evaluate our programs? Or would you put your money into raising the reading comprehension level? What about mandated programs? Some states have already given schools and/or school districts permission to ignore mandated requirements. It can be both an awkward and perplexing situation for a director.

Another source of perplexing problems for the industrial education director is the increasing interest and activities on the part of private enterprises in the field of education. Many firms have built their organization to cater to educational needs through the production of both hardware and software. Others have developed training programs and staffs to meet their own needs and then found that there was a market for these services. Then of course there are the universities and foundations which develop systems and then must have a proving ground.

Each is looking at the big business of education and saying, "The schools have failed. We are realistic. We are technologically up-to-date and proven. Listen to our proposal. We propose to accomplish – and evaluate – for a price. If we fail, no further contract – but if we are successful, expand our contract." Fantastic? Impossible? Not at all. Many contracts have been made by public schools in many curricular areas. Consider the awkward situation of an administrator who must evaluate his organization's achievements and potential against these proposals and submit a report to his superintendent and board.

A little earlier I stated that society had placed upon the public schools the responsibility for building an effective and reliable bridge linking youth and adult life. This educational bridge should permit every individual to acquire the basic learning skills, appropriate entry-level job skills and a foundation for further growth.

As an educational administrator in an urban city, I believe that a new order of industrial arts and vocational education must be built into the bridge, or else the teeming social and economic problems of big-city inhabitants will fire many revolutions – a bridge that is failure-proof, where, in the words of Dr. Kishkunas at this Association's convention last year:

> students of all sizes, colors and shapes will be accepted and provided with myriads of alternatives through which they may progress and move to higher education or to a productive job in society. Industrial arts and other skill-centered exploratory programs, together with vocational education, must provide a continuum of training". (p. 69, New Concepts of IA, Proceedings of the AIAA 30th Annual Convention)

I believe we can meet the challenges of today and tomorrow.

Shall we start with industrial arts?

Do we know where we are going and how to get there? As I read our professional journals and listen to the divergent opinions expressed at this and other conventions I wonder when we will agree and push progress into high gear.

What have you heard about career development?

The term is familiar. We have been saying for years that career guidance was a fundamental and unique part of industrial arts. Evidently we were not too successful, for today career development programs are growing in many school systems. They are making considerable progress in setting up learning experiences to meet more effectively what formerly was a major industrial arts goal. If you are concerned about industrial arts, where it is today and where it will be in 1980, you will agree that there is a need for immediate positive mutual agreement and action.

I believe that it is difficult to build an effective and efficient vocational education program for any community without a good industrial arts program that really meets the needs of all youth. Surveys have indicated that students who had unsatisfactory industrial arts experiences rarely elected a vocational program.

The critics have been outspoken concerning vocational education offerings with a dominant theme that not enough youth have been properly prepared for the kinds of jobs that exist in the world-of-work. Congress has supported vocational education and at the same time funded many alternative vocational education activities. Some of these are:

NAB Jobs	$162,000,000		
CEP	83,000,000		
New Careers	19,000,000		
NYC	130,000,000		
NYC - Summer	125,000,000		
Job Corps	280,000,000		
MDTA	176,000,000		
		TOTAL	$975,000,000

In addition, many local non-profit semi-public and private organizations have come forth to meet the unfilled need for vocational education. A good example of this is the Opportunities Industrialization Center, which has nearly a hundred national and twenty international branches.

Vocational education needs industrial arts. Together they can develop industrial contacts and mutually upgrade programs to provide the wide linkages needed to help youth in the transitionary preparation period leading to full participation in adulthood.

I have tried to indicate major areas of concern that a director of industrial education in a large city faces as he strives to serve the varying needs of students, parents and the community for both today and the '80's.

To assist the director in making decisions, thoughtful consideration must be given to the following:

(1) Maximum sensitivity to individuals and community needs, conditions and forces.
(2) An understanding of the technological influences on the communities' problems.
(3) The common goals and potential of industrial arts and vocational education.
(4) The expectations of intra-educational systems' cooperation, which influences the over-all potential for industrial arts and vocational education.

In closing I would like to quite Rev. Dominique Pire: "Men build too many walls and not enough bridges." I ask you, have we built and are we continuing to build too many walls around industrial arts?

Dr. Kelly is director of vocational education, The School District of Philadelphia, Pennsylvania.

Supportive role of industrial arts in the total program of occupational education

Milton E. Larson

Occupational education is on the march in the United States. The Vocational Education Act of 1963 broadened the base of Federal support and gave renewed emphasis and stimulus to vocational and technical education.

While the story of growth is only partly told by the numbers in programs, this is nevertheless useful information. Since the Vocational Education Act of 1963 produced an initial impact in 1964, let us start with this year. In 1964 we had approximately 4-1/2 million students enrolled in vocational and technical education programs. For 1970 this is projected to be about 9-1/2 million and, by 1975, 14 million or nearly three times the 1964 enrollment in just a short period of 11 years.

This is just the beginning. To achieve the goals and provide the kinds of educational programs essential really to serve the needs of people requires a massive, total integrated effort. All people in education must broaden their vision and see more clearly the total picture of the preparation of children, youths and adults for both life and earning a living. Education must mesh together more smoothly and more effectively than ever before. The focus must be sharply fixed on the individual (whether white, black, red or brown) and on his complete assimilation into the culture and the world of work of our great democracy. We have no alternative – other than chaos.

Recently at the AVA we were told by one speaker, who is state director of vocational education for one of our major industrial states, that if vocational education is to meet the needs of the future our goals must be:

(1) Zero rejects,
(2) Zero dropouts and
(3) 100% placement.

This can only be achieved by vastly expanded and improved programs of vocational and technical education supported by more effective programs of industrial arts. Our slogan for the future must be, "United to serve the needs of people." The needs of students must be served – and they must be served in the future much better than they have been served in the past. Too often in the past we have demonstrated our interests in the needs of students by telling them what is educationally best for them instead of fully recognizing their individual interests and desires vocationally. Telling helps but that is not enough. Individuals, even at an early age, must have experiences which help them to decide, with the help of guidance, the direction which their lives will take. This is a key role for industrial arts and a significant contribution to the decision-making process for each student. Help the student to find himself, his interests and his abilities.

Occupational information and broad experiences oriented towards occupational fields must be introduced at an earlier age and on a universal basis if the process of personal understanding and occupational decision-making is to be accelerated – as it must be. We cannot wait until the students are in high school to begin this important part of the educational process. It must begin in the elementary school and during the early grades.

Our educational system must improve the means of ascertaining, validating, and developing the interests of every boy and girl. This is a big assignment. It cannot and will not be done if we are going to depend solely upon departments of guidance to do it. For the 80 percent who will never possess a four-year degree, industrial arts must help provide the opportunity for early identification of individual interests, abilities and occupational goals in broad categories. This is, I believe, the greatest opportunity of service which industrial arts can provide. This may be a greater contribution to the student than any educational experience in which he has participated up to that time. To achieve this we must have:

(1) More comprehensive programs of industrial arts
(2) Teachers of industrial arts who believe in this function of industrial arts
(3) Facilities and equipment geared to the program objectives
(4) Curriculum development synchronized to mesh with the other curricula of the elementary and secondary programs of general education, and built to be integrated with a system's approach to vocational and technical education which must follow.
(5) The role of industrial arts must be accepted as that of primarily teaching students "about work" rather than focusing specifically on a single trade, occupation or even a cluster of occupations. This is the job of occupational education. Both must support each other and keep uppermost in mind the needs of the student at each phase of progression. One is not better than the other – both are necessary. Competition, if it exists, should give way to cooperation. Status for the teacher and department should come from success in achieving clearly-delineated goals which are mutually reinforcing but not duplicating.
(6) Funding patterns must be so developed both at the local, state and Federal levels that both vocational education and industrial arts are adequately financed. Opportunities for securing additional dollars should not be the factors which shift objectives and throw the program out of orbit.
(7) Industrial arts educators must have a broad enough and a deep enough knowledge of the world of work to stimulate and cultivate the interests of students effectively. This is a real challenge involving many fields, materials and tools of production and servicing.

As a vocational education specialist, I see tremendous opportunities for industrial arts to produce a really major impact upon the lives of children and youth. I believe industrial arts will make its greatest contribution to the needs of people and provide the greatest assistance to vocational education if it will:

(1) Offer exciting, challenging exploratory experiences from a broad spectrum of the world of work on a graduated scale beginning early in the lives of children and employing the world of work as the resource medium.

(2) Provide experiences which are realistic and effective in the identification of interests, abilities and desires and stimulate an effective impetus towards self-realization and providing the tools for decision-making essential for determination of occupational choice.

(3) Build a bridge for youth to vocational education, so that those eight out of ten who will enter the world of work without the benefits of a four-year college degree can recognize:
   a. the nature of work and the pride of accomplishment which should be a part of every good performance no matter what the level is.
   b. create an interest in work and recognition of its values to the individual and to the society of which he is a part.
   c. begin the process of teaching "how" to work and the nature of activities of the main families of jobs.
   d. the climate essential to a work environment and the opportunities, duties and responsibilities of each individual who is a part of the enterprise.
   e. break down false and ancient concepts of "status" and substitute instead a "team" approach to participation in a realistic experience.
   f. work closely with guidance personnel, other teachers and members of administration in paving the way for better acceptance of programs of vocational education. If we are members of the same team, we must grow in understanding and recognition of our part in the total process of education to meet the needs of students.

Each one of us has "acres of diamonds" in his own backyard. The potential of the gems is great – but much processing is necessary. As industrial arts educators, I see your role as one:

(1) Where you pick up the rough stone – see its potential

(2) Where you begin the process of sorting and sifting – not you alone but helping the individual, the student, to carry out this process for himself

(3) Where you begin to remove the rough edges and help the individual to identify further opportunities through vocational education for additional refinement and polishing, which are necessary to achieve the higher price in the market place of industry and business. The polishing also provides the opportunity for maximum reflection of that inner light so essential to the feeling of accomplishment. It helps the "buyer" in his selection process and assures the quality and quantity which were uncertain prior to cutting and polishing.

Industrial arts can make the role of vocational education more effective. Industrial arts must be a significant experience in the lives of most of our young people – if the problems of the inner-city, of unemployed and underemployed, yes, if many of our social problems of today and tomorrow are to be solved! Industrial arts must step briskly forward and assume its role with more courage, determination and vision than have been exhibited in the past. Not only the eyes of vocational education are upon you but also the eyes of millions of "youth whom we have not served!"

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information science

ERIC—information resources for industrial arts

Joel H. Magisos

Industrial arts teacher educators, researchers, administrators and teachers share with all educators the need for information to help solve the critical problems facing them. The management of the information needed has become increasingly difficult as the pace of activity has increased and the body of information has grown. Most people prefer those sources of information which are most readily available (e.g., an office-mate, the current journal issue, a favored textbook). When important decisions must be reached, however, the most recent and reliable information is favored.

ERIC--the Educational Resources Information Center--was established by the US Office of Education to provide a national system of acquisition, storage, retrieval and dissemination for education. Early efforts in establishing the system were directed at acquiring and managing the materials to be included in the system. This effort has resulted in the establishment of new agencies, new information products, and new approaches to the dissemination of information. It will be my purpose to describe more recent developments and to challenge industrial arts educators to utilize ERIC. As with any sophisticated, institutionalized program, ERIC requires understanding based upon study. Educators, if anyone, should appreciate the importance of self-initiated continuing inquiry. ERIC requires this study if it is to be utilized effectively. Though ERIC was designed to permit ease of access by users, some have assumed that, by some new-found magic, it would be completely self-operating. Contrary to this popular hope, the system does require a bit of study and patience.

It is important to understand that the ERIC system is as useful to a given educational field as are the inputs to the system. Of nineteen ERIC clearinghouses coordinated by Central ERIC, one clearinghouse focuses upon research documents and related resources in vocational and technical education, new sub-professional fields, and the related fields of industrial arts, manpower economics, occupational psychology and occupational sociology. The ERIC Clearinghouse on Vocational and Technical Education is a component of The Center for Vocational and Technical Education located at The Ohio State University in Columbus, Ohio. It is, then, at VT-ERIC that the main activity in direct behalf of industrial arts is carried out. Within the general framework of The Center organization, several fields are brought together for attention.

Understanding the relationship between The Center for Vocational and Technical Education and the component ERIC clearinghouse requires knowledge of The Center program.

The Center for Vocational and Technical Education has five major objectives:

(1) To provide continuing reappraisal of vocational and technical education.
(2) To conduct research studies for new knowledge and new applications of existing knowledge.
(3) To stimulate and strengthen state, regional and national programs of applied research and development.
(4) To upgrade state vocational education leadership.
(5) To provide a national information retrieval, storage and dissemination system.

These objectives have been converted into four major functional thrusts: Research, development, state leadership training and dissemination.

The Center itself is funded by the USOE Bureau of Research (Division of Comprehensive and Vocational Education Research) and maintains liaison with the Division of Vocational and Technical Education in the USOE Bureau of Adult and Vocational Education. The contract is between the Federal agency and The Ohio State University Board of Trustees. The director of The Center, Dr. Robert Taylor, reports directly to the Provost and Vice-President for Academic Affairs. He also relates himself to appropriate OSU deans and a national advisory committee. The senior specialist staff hold joint appointments in appropriate university academic departments.

Internally, The Center is organized under the director with a sustaining staff; coordinators for research, development and training, and information services; and the research and development specialists. The information services coordinator is responsible for both the ERIC clearinghouse and the research library.

The Center professional staff is composed of an interesting mix of vocational educators, educators, behavioral scientists and information scientists. The efficiencies of

The Center are in the critical mass of resources, the complementary thrusts and multiple yields, cooperative efforts with states, effective collaborative efforts with other institutions, location, research associates, management systems and responsiveness.

Some idea of the scope of operations can be gained from the fact that 117 national research, development and leadership seminars have been conducted which have involved 4,540 persons from 50 state departments of education and 250 institutions of higher education. At this time 127 publications have been prepared, 11 are at press, 18 are projected for this year, and 20 are in the manuscript stage. In spite of a wide free distribution, 30,210 copies have been sold. All documents are entered into the ERIC system to be available in microfiche or hardcopy.

The Center is housed in a new building provided by the university. It has 30,000 square feet, 100 offices, three conference rooms, an auditorium, a large library, and three laboratories. The library now is comprised of 6,653 monograph titles, 436 dissertations on microfilm, 427 journal titles, and 23,575 titles on microfiche. The resources of this organization are available to the staff working in a number of relevant areas, and to those who choose to take their sabbatical leave at The Center.

Within this broad context, industrial arts has been a continuing commitment on the part of The Center and the ERIC clearinghouse. One of the first three document analysts was an industrial arts educator. The Center sponsored a national conference on research in industrial arts education this past October. A review of an early draft of the conference report revealed that a research priority model was proposed. An activity of VT-ERIC has been the sponsorship of review and syntheses of research in service fields and problem areas. One of the first of these papers was the Review and Synthesis of Research in Industrial Arts Education by Streichler. (1) Several problem-oriented papers have been, or are being, prepared, such as the one on the economics of vocational education by Warmbrod. (2) These latter papers have usefulness for all educators. A second generation of service-field-oriented papers is being developed, including one for industrial arts by Dr. Dan Householder and Dr. Alan Suess. Another noteworthy development of interest to industrial arts educators is the employment, by The Center, of Dr. Frank Pratzner as an industrial arts senior specialist on the research and development staff. Dr. Pratzner will bring to The Center a valuable viewpoint which will stimulate increased activity for industrial arts education.

At this point, it seems important to put VT-ERIC in context with the total ERIC system. VT-ERIC is one of 19 clearinghouses which input resumés of materials to Central ERIC. Central ERIC produces a publication, Research in Education (RIE), (3) which provides abstracts and indexes of completed and ongoing research. An ERIC contractor, Crow-Collier-Macmillan, is beginning publication this month of Current Indexes of Journals in Education (CIJE). Another contractor, National Cash Register Company, provides microfiche and hardcopy of ERIC documents to the users. Known as the ERIC Document Reproduction Service (EDRS), this organization produces and sells microfiche on an individual, complete collection, or standing order basis. Current ordering instructions are provided in the latest issue of RIE.

Some of the materials which are not announced in RIE are placed in one of two quarterly publications, Abstracts of Research and Related Materials in Vocational and Technical Education (ARM) (4) and Abstracts of Instructional Materials in Vocational and Technical Education (AIM). (5) These publications contain resumés of documents cited in RIE plus other documents which will not be cited in RIE. The documents that are not available as individual microfiche under a separate ED number are available in a set of microfiche which backs up each quarterly issue of AIM or ARM. Microfiche in the AIM and ARM sets are continuously filmed in VT number sequence. Listed under an individual ED number, each set is announced in a later issue of AIM, ARM or RIE.

It is apparent, then, that industrial arts users of ERIC make inputs to ERIC through their own clearinghouse (VT-ERIC). These inputs become part of either the clearinghouse collection announced in AIM or ARM or the Central ERIC collection announced in Research in Education. The user may meet his own needs by searching these three documents (AIM, ARM, or RIE) or other information products of Central ERIC, VT-ERIC or other clearinghouses. Microfiche, the full-text back-up for documents in the ERIC system, is in the form of 4 x 6-inch film which may be projected by means of a microfiche reader. Full-size copies of individual pages may be produced on a microfiche reader-printer. Six million microfiche were sold in 1968, a three-fold increase over sales in 1967. Standing orders for the complete collection of microfiche for documents announced in RIE are now in force for 185 organizations, mostly in institutions of higher education.

At present, the user utilizes the printed indexes in the information products of the system. A number of search strategies are possible, the choice of which depends upon the need. Three such plans are described in an article by Taylor and Wilson in the Journal of Industrial Teacher Education. (6) In fact, the article by Taylor and Wilson provides much valuable information about the ERIC system and its potential for industrial arts educators. After finding relevant material, the user examines the appropriate microfiche. Availability of a microfiche collection and appropriate equipment is necessary, of course. ERIC products, microfiche collections and equipment are becoming increasingly available in universities, colleges, state departments of education, vocational education research coordinating units and local school districts. VT-ERIC has been making a special effort to help state vocational education research coordinating units improve their capacity to provide service and products on an interpersonal relationship with users. The multilevel nature of the ERIC system precludes direct access to the collections through the clearinghouses or Central ERIC for the obvious reason of limited resources. The eventuality of direct interface with the central collection may eventually be possible by means of remote terminals to an electronic computer, but this is still in the developmental stages.

Emphasis currently is being given at VT-ERIC and other clearinghouses to the development of information analysis products. Projected are the development and dissemination of additional state-of-the-art papers; terse factual integrations of several sources; pertinent information for specific problems; and interpretive writing for specific target audiences. Most of this activity must be preceded by and concurrent with studies of the information needs arising from the significant problems of important user groups.

As the clearinghouse moves ahead on several fronts, the users must also move ahead in their capacity to use the new products and services. It is recommended that industrial arts educators develop this capacity to use the system by:

(1) Studying the ERIC system and its products.
(2) Making inputs to the ERIC system by sending two copies of materials to ERIC.
(3) Subscribing to RIE, AIM and ARM.
(4) Equipping with a microfiche reader.
(5) Acquiring a collection of microfiche.
(6) Developing a strategy for searching the ERIC collection.
(7) Watching for new developments.

Making inputs into the ERIC system may take more than one route. If the material is a report of a USOE-funded project, it should be submitted to the project officer, who will send copies to the ERIC facility, which assigns it to an appropriate clearinghouse for abstracting and indexing. Other materials can be submitted to a clearinghouse. A mechanism exists to prevent duplicate entries. Dissertations which are handled by University Microfilms can be abstracted and indexed for announcement in RIE, but cannot be backed-up by microfiche. VT-ERIC requires a complete copy of the dissertation report, even though it cannot be filmed by ERIC, because only then can it be accurately abstracted and indexed. The copy is retained at VT-ERIC for incorporation into The Center's research library.

Many of the foregoing steps for utilization of ERIC can be accomplished in concert with a professional library or other agency, but use of the system depends upon the individual. The presentations at this meeting are meant to support these requirements. The burden of accomplishment, as always, lies at the feet of the learner. Beginning use of the ERIC system may be such a simple act as deciding to find information to solve a problem by utilizing the indexes of AIM, ARM and RIE. It will be found that the system is as easy to use as conventional libraries, a good deal more accurate in indexing, and very gratifying in yield.

FOOTNOTES

(1) Jerry Streichler, Review and Synthesis of Research in Industrial Arts Education, Columbus: The Center for Vocational and Technical Education, The Ohio State University, 1966 (ED 011 564).

(2) J. Robert Warmbrod, Review and Synthesis of Research on the Economics of Vocational Education, Columbus: ERIC Clearinghouse, The Center for Vocational and Technical Education, The Ohio State University, 1968 (ED 023 937).

(3) Research in Education, Washington, DC: US Government Printing Office (published monthly).

(4) Abstracts of Research and Related Materials in Vocational and Technical Education, The Center for Vocational and Technical Education, The Ohio State University (published quarterly).
(5) Abstracts of Instructional Materials in Vocational and Technical Education, The Center for Vocational and Technical Education, The Ohio State University (published quarterly).
(6) Robert E. Taylor and Celianna I. Wilson, "Information Services for Industrial Educators," Journal of Industrial Teacher Education, Vol. 5, No. 4, Summer 1968, pp. 5-12.

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The work of the industrial arts document analyst

Emmett E. Mason

The ERIC Clearinghouse for Vocational and Technical Education began operation in March of 1966 when the first employee was hired. This person was the coordinator. In the next few months an editor and one secretary were hired. In May and June of that year the first three abstractors were employed. I was one of those three persons and at that time was known as the Industrial Arts Abstractor. The other two people represented the fields of trade and industrial education and business and office education.

In the time since June, 1966, the position which I hold has come to be known in our official reports as that of Industrial Arts Document Analyst. During this same time the role of the Industrial Arts Document Analyst has undergone considerable change, as has that of the other document analyst positions.

In the beginning abstractors had three major tasks: (1) abstracting, i.e., writing 200-word abstracts which report or describe the contents of a particular document; (2) indexing, i.e., the selection of specific ERIC descriptors which describe the contents or the form of the document; and (3) searching the document for reference to or citations of other documents which the VT-ERIC Clearinghouse should obtain for inclusion into the ERIC system.

Presently, the document analysts continue with these three basic tasks and, in addition, review each document (1) as to whether or not it is within the scope of our clearinghouse; (2) as to its form, such as instructional material, bibliography, research report, speech, dissertation, or one of 13 other forms which we have identified; (3) as to the educational field it falls within, such as industrial arts, one of the vocational education fields, manpower economics, occupational sociology or occupational psychology; (4) as to which of 14 topical categories such as administration and supervision, curriculum, philosophy and objectives, teaching and learning it falls into; and (5) whether the document has good or bad microfiche reproduction quality.

In addition to this review we maintain records showing the decisions made in this review, and we maintain records of time spent on each document for cost accounting purposes.

A related but separate task has evolved, which consists of identifying and defining new descriptors which we recommend for inclusion into the Thesaurus of ERIC Descriptors. This thesaurus is the basic indexing reference tool and contains all the previously-accepted descriptors used by all the ERIC clearinghouses. This thesaurus is updated on a regular basis; each clearinghouse has the opportunity to submit new descriptors each month.

This is a brief explanation of the kinds of tasks which comprise the work of the industrial arts document analyst. Now let's turn to the products which result from the work of the document analysts at the VT-ERIC Clearinghouse. I mentioned that abstracting and indexing were among the original tasks, and I want to emphasize that they have continued to be basic tasks. These two activities result in what is called a resumé. A resume has four major sections. The first section contains an ERIC accession or identification number and a clearinghouse accession or identification number. These numbers are composed of two letters, such as ED or VT, and six digits, and they are used as control and identification numbers. The second section contains the bibliographic and availability information. Typically, this includes the author, title, publication date, number of pages, and prices for microfiche and hard copy reproductions. The third section contains the descriptors and identifiers. These are words which are used to index the document. And the last section contains the abstract and the initials of the document analyst. The abstract, as was stated before, is a 200-word (or fewer) description or report of the contents of a particular document. The resumé for one document is a result of the work done by one document analyst, editors and various clerical personnel. It is the principal means of disseminating information about a particular document in most ERIC publications.

The major ERIC publication is Research in Education (RIE). It contains resumés that have been contributed by each of the 19 clearinghouses on a monthly basis. It is published by the US Government Printing Office on a subscription basis. This publication has two major sections. First is the Document Section, which contains the resumés prepared in the several clearinghouses and three indexes to these resumés. These indexes are the subject index, the author index and the institution index. Second is the Project Section, which contains the resumés of ongoing Federally-financed educational research and development projects. This section has the same three kinds of indexes as the Document Section. An additional minor section is the Accession Numbers Section, which gives a table of cross-reference numbers showing the clearinghouse accession number for each ERIC accession number. Also included in Research in Education is information on how to order microfiche and the several ERIC publications. One of these publications is a semi-annual index to the projects and documents reported in RIE.

To help disseminate information about documents which could not appear in Research in Education, our Clearinghouse began two quarterly publications with a format similar to Research in Education. Again the basic information unit is the resumé. One of these publications is Abstracts of Instructional Materials (AIM). Resumés for documents which are appropriate for use in the classroom by teachers or students are found here. Typical examples would be curriculum guides, study guides and resource units. The other publication is Abstracts of Research and Related Materials (ARM). Resumés of all the other kinds of documents except instructional and curriculum materials are found here. Each of these publications has several indexes which allow access to the resumés.

For Abstracts of Instructional Materials the indexes are author index, document number index, an accession number conversion index and a subject index. The resumés in this publication are not ordered by accession number, and so the document number index was added to provide the page number on which each resumé is located. In addition, the resumés are organized in sections by educational program area, one of which is the Industrial Arts Education Section. This arrangement allows readers to browse through all the resumés relating to an entire program area. A source list is given, listing publishing agencies arranged by states.

For Abstracts of Research and Related Materials, the indexes are the same as for AIM plus another index for Vocational and Supporting Services. This index allows readers to find all of the industrial arts documents in that issue of ARM. In addition, the resumés are arranged by the several categories which the document analysts identified during their review of the document prior to abstracting and indexing. This allows readers to browse through all the resumés relating to one of the topical categories. Also available is an annual index which covers both AIM and ARM.

In addition to these three publications, the VT-ERIC Clearinghouse provided the bulk of the resumés which appeared in the first annual edition of Manpower Research Inventory for Fiscal Years 1966 and 1967 (VT-ERIC will also prepare the resumés which will appear in later editions). The purpose of this publication is to disseminate information relative to manpower research findings. Many of the reports found here are appropriate for consideration by educational personnel.

The ERIC system has recently begun a new activity, that of indexing selected educational journals and periodicals for input to a new index publication. This monthly publication is the Current Index to Journals in Education, a computer-generated index which was available for the first time in April, 1969. Coverage will be given to 200 educational journals and periodicals, and the indexing will be done in the several clearinghouses. This new index is a companion to Research in Education but does not contain abstracts. The Current Index is to be cumulated semi-annually and annually and will use ERIC descriptors.

In order for these ERIC publications to be of value, the readers should have an understanding of the information which is available in each section of these publications. To reinforce the preceding discussion, the following resumé is presented. It appeared in Research in Education, October, 1967.

FIGURE 1

ED 011 564 VT 002 320

Review and Synthesis of Research in Industrial Arts Education.
By-Streichler, Jerry
Ohio State Univ., Columbus, Ctr. Voc. and Tch. Ed
Pub Date-Aug 66
EDRS Price MF-$0.50 HC-$5.10 102 p.

Descriptors- *Bibliographies, *Educational Research, *Industrial Arts, *Review (reexamination), Columbus, Curriculum Development, Educational Administration, Educational Equipment, Educational Facilities, Educational Needs, Educational Objectives, Educational Philosophy, Educational Planning, Educational Programs, ERIC Clearinghouse, Instructional Materials, Learning Processes, Program Evaluation, Student Personnel Services, Teacher Education, Teaching Methods,

Dissertations, theses, staff studies, personal research, periodical articles, yearbooks, and speeches from 1960 to 1966 are reviewed. Topics discussed are (1) Philosophy and Objectives, (2) Curriculum Development, (3) Instructional Materials and Devices, (4) Learning Processes and Teaching Methods, (5) Student Personnel Services, (6) Facilities and Equipment, (7) Teacher Education, (8) Administration and Supervision, (9) Evaluation, and (10) Research. The author concluded that excellent examples of research exist in experimental work, in follow-up research employing causal-comparative methods, and in some philosophical studies. However, much of the research done because of degree requirements was thought to be of extremely poor quality. By accepting low quality standards, institutions may be producing individuals who erroneously conceive themselves able and accomplished researchers. Major questions concern industrial arts objectives and teaching methodology. Research efforts in the near future at least, will be directed to the concerns raised by the major curriculum projects. (EM)

Note these points from the resumé in Figure 1: The author, the publishing agency, major descriptors, and accession numbers. Many persons concerned with industrial arts would find this resumé of interest, but how would they go about finding it without prior knowledge?

The indexes represented in Figure 2 illustrate the citations of this resumé which could be located by focusing on the key points just mentioned in Figure 1. Several of these require some prior knowledge of one kind or another. In the author index the title and ED number are given after the author's name. The use of his name in a search effort would assume some knowledge about the author's area of interest or that he had actually written on this subject. By knowing this the searcher would be led to this title and accession number.

FIGURE 2

RESEARCH IN EDUCATION Indexing Example

AUTHOR INDEX
  Streichler, Jerry
    Review and Synthesis of Research in Industrial
    Arts Education ED 011 564

INSTITUTION INDEX
    Ohio State Univ., Columbus, Center for Voc. Educ.
    (Full name Center for Vocational and Technical
    Education)
        Review and Synthesis of Research in Industrial
        Arts Education ED 011 564

SUBJECT INDEX
    *Educational Research
        Review and Synthesis of Research in Industrial
        Arts Education ED 011 564

    *Industrial Arts
        Review and Synthesis of Research in Industrial
        Arts Education ED 011 564

CROSS REFERENCE INDEX
    VT 002 320
        ED 011 564

The use of the institution index also assumes some prior knowledge, namely where the document was published. If this is known, the searcher would be led to the title and the accession number. The subject index contains all the descriptors indicated by asterisks (*). Only two of these major descriptors are illustrated here, but any of them would lead the searcher to the title and accession number. This is the most useful index for general use in finding information on a particular topic, problem or area of interest. It assumes no prior knowledge.

The accession number cross reference index assumes some prior knowledge of one or the other accession numbers. For example, a periodical or journal might cite this document indicating a clearinghouse accession number such as VT 002 320. A search on this number would lead to the ED number, which would allow the location of this particular resume. It is important to remember that both resumés and microfiche are located by accession numbers, so any citation of an ERIC document should carry either a clearinghouse or ERIC accession number.

The ERIC system has been designed to help a variety of user groups, such as teacher educators, researchers, teachers and administrators, by providing ways of getting at the large collection of documents already on microfiche and by providing publications containing resumés from which information searches can be done rather quickly and easily. The resumés provide a means of further screening, that is, they allow personal selection of documents which is not entirely possible by just the use of descriptors for searching.

This system can only work if the relevant literature from the field of education is contributed for processing. Examples of the kinds of documents needed are research reports, instructional materials, research reviews, curriculum studies, conference reports, papers, speeches and bibliographies. A collection of this variety of literature from across the United States, and in some cases from other nations, should prove valuable to you in a variety of ways. Bibliographies which give author, title and accession number can be quickly generated on any of the concepts or topics represented by the descriptors used in the subject indexes. Literature reviews are possible on a segment of research and literature not previously readily accessible. Current information on solutions to pressing problems which is being generated by others in the country with the same problems can be found quickly. And the simple act of browsing through the resumés from a particular clearinghouse or on a particular topic is a good means of alerting oneself to the topics and materials from a particular segment of the educational field or from groups working on a particular topic.

Mr. Mason is an industrial arts document analyst at the ERIC Clearinghouse, The Ohio State University, Columbus.

space technology

Aviation and space expand industrial arts horizons

Eugene L. Miller

The traditional industrial arts program can be modernized and greatly stimulated with the incorporation of aerospace technology. This may be done with limited knowledge, facilities and money. It was through my participation in the Aerospace Institute at Central State College, New Britain, Connecticut, that I was able fully to understand the necessity for aerospace education in our secondary schools. North Dakota is primarily an agricultural state and because of this, I had allowed myself to become stagnant in traditional concepts and subject areas.

The institute gave me the opportunity to visit many of the industries associated with aerospace. Also, the association with fellow teachers interested in aerospace increased my desire to break away from tradition and develop a program more suitable to our modern youth.

The first logical step was to analyze my own program to see just how it could be reorganized to accept aerospace education, and to what degree it could be incorporated. Our high school has 1,750 students in grades ten, eleven and twelve. Classes in industrial arts consisted of Mechanical and Architectural Drawing and Auto Mechanics I. Auto Mechanics II is a vocational course and is offered only to twelfth-grade students because of limited physical facilities. Auto Mechanics I is offered to eleventh-grade students only, and has been primarily a "feeder" program for the vocational course. The content of this course was centered around the automobile and all occupations related to the automotive industry, as well as the mechanics involved. We have 130 students in this program, which was originally divided into four classes with two instructors. Because of computer scheduling, we were unable to combine these classes until the second semester of this year. During the first semester of this year, I developed a program of Power Technology. I incorporated aerospace power systems in anticipation of combining the classes for the second semester.

The resulting course is now called Power Technology. The classes have been combined into two classes, with myself and another instructor sharing the teaching duties. He teaches the subject matter of the conventional power systems, and I teach the aerospace power systems. Using team teaching, we have been able to build a great deal of interest in the program in less than a semester. Registration for the next school year has already indicated a need for another full-time instructor in this program. The administration of our school system has recognized this program as the fastest-growing program in the system, and has authorized the addition of another instructor. Steps are also being taken to organize an aerospace club in the high school next year. We have obtained a jet engine, formerly used in an F-80, to be used in classroom instruction. Because of the severe winter and heavy snowfall, we have been unable to move it into the high school. In checking with our State Surplus Agency, we feel we will be able to get all the materials we can possibly use, at a very low cost. North Dakota has two major air bases, which are continually releasing surplus property to the State Surplus Agency. Through the use of government surplus and materials donated by local aviation companies, we are assured of enough material to operate our program in Power Technology.

A new high school is planned for 1973. With new facilities, we are positive industrial arts will be enriched by many more phases.

Mr. Miller works in the Aerospace and Transportation Workshop, Bismarck, North Dakota.

elementary schools

Industrial arts in the elementary school

Earl M. Weber

It is, I think, fair to tell you that I have no particular credentials or experiences that qualify me to appear as a speaker on the subject of industrial arts in the elementary school. Of course, I have had experiences in industrial arts as all of you have had – and I have read, as you have, the literature on industrial arts, including that which is concerned with the elementary school programs. I sat on the Executive Board of this Association (at the 1962 convention in Pittsburgh) when Miss Elizabeth Hunt presented a petition which resulted in the formation of the council known as ACESIA. But I have not had any real first-hand experience in this field.

In the brief time allotted to me on this program, there are two points I would like to make. These two points are somewhat related but not interdependent. Either of them can be accepted or rejected without much influence on the other. In other words, I do not have a two-point plan that will guarantee the success of industrial arts in the elementary school. But both are matters that have for some years been of concern to me and matters to which I have given some thought.

The first point has to do with the controversy that exists as to how industrial arts should be taught in the elementary schools. That is, should it be purely supportive, or should it promote its own specialized content field? ACESIA President Thieme wrote a provocative editorial in a recent issue of the Newsletter in which he points out that years of the "we are willing to help you" or "we can show you how to enrich your curriculum" attitudes have not resulted in any appreciable gains in industrial arts activity in the K-6 groups. He concludes, as others have, that the alternative is to present our own program or subject field. They argue that the content is technology (or industry), and time must be provided for the inclusion of this important subject field in the elementary curriculum.

Another dimension of this controversy is concerned with who shall teach industrial arts in the elementary school; shall it be the regular classroom teacher with some preparation in industrial arts, or a specialist whose major training is in the field of industrial arts education? Directly related to this problem is the matter of facilities; should every elementary classroom be equipped as an industrial arts laboratory; should there be one (or several) well-equipped labs available for use as needed; or should portable facilities (work benches on wheels and tool kits) be brought into classrooms as needed?

These seem to be the dimensions of the problem we hear about most frequently. But there is another very important consideration. It is the attitude of the professionals in elementary education. If I am not sorely mistaken, I believe there is a growing resentment and resistance on the part of elementary educators toward organized subject matter groups and their "interference" in the education of children in the elementary grades.

Mathematics groups meet and "decide" what math should be taught in each grade; art associations plan and promote art activities for the elementary school; music, language, science and health organizations meet in conventions and plan programs for the elementary school; and here in Las Vegas we are trying to decide how to squeeze industrial arts into an elementary program that appears to have little squeezing room left.

What then is a possible solution?

I would suggest that ACESIA and other pertinent organizations initiate a dialogue with elementary education organizations. This should include the whole range of techniques, from writing articles for publication in their journals, and requests to speak at their meetings, to joint conferences and one-to-one informal meetings in the colleges and school systems of the country. The plan should include prepared items for radio, TV and the press. Film and slide presentations should be prepared for showing to local education and civic groups. I am talking about a large-scale, organized public-relations (propaganda if you wish) effort.

Enough of that – now what is it that should be said in their dialogue – what is it that we want to promote?

Dr. Scobey provides us with an answer to that in the introductory chapters of her book Teaching Children About Technology: "Industrial arts in the elementary school... is an authentic inclusive study of industry and technology." The scope of industrial arts includes: the relationship between technological development and social change; it provides unique opportunities for real learning experiences; and it is especially well-equipped to accommodate individual differences among students.

My belief is that to promote a separate, specialized content field in the elementary program is not likely to be very successful. On the other hand, to relegate industrial arts to a simple craft approach is not at all significant. Nor is it sufficient to be ready to help if we are needed. "We are studying Egypt in our class – can you come in and show us how to build a pyramid?"

Rather than any of these, a study of industrial arts should be integrated. Referring to Dr. Scobey again, "As an integral part of the elementary school curriculum, industrial arts can re-inforce almost all school subject matter areas of the curriculum, as well as contribute its own unique content related to industry."

This integrated approach, I believe, gives us an answer as to who should be the teacher. The general classroom teacher is in the best, if not the only, position to make this kind of an integrated program work. This does not preclude the possibility of special consultants or industrial arts specialists being on call to give technical assistance when needed.

The question of facilities is also answered by this integrated approach. Every classroom should have a workshop area. Again, this does not preclude special portable equipment or a separate laboratory – but these should be in addition to the standard equipment in each classroom.

The matter of deciding what units of work to study at what grade level, i.e., communications, construction, transportation, etc., must also be considered, but this poses no real problem as far as I can see.

In summing up my first point:

Industrial arts in the elementary school should be an integrated part of the total curriculum.

It should be taught by the general classroom teacher.

Industrial arts professionals should seek the advice and help of elementary education professionals in the planning and integration of industrial arts content.

The second point I want to make, and I shall be very brief about it, has to do with the teaching of values. My thoughts here do not apply only to elementary education, but because of the impressionable age of these children they are especially important here.

In planning industrial arts content it is quite logical that we are concerned with the question "How?". How are goods produced? How are materials processed? How are products transported? How does man communicate? – etc.

If you remember the definition of industrial arts by Wilber, you will recall that the last phrase has to do with "... the problems resulting from the industrial and technological nature of society."

I don't believe we have ever really addressed ourselves to this problem. We have been obsessed with how, but not much with why, or what effects will it have on man? Or, what priority should it be given? Why do we want (or need) a bigger engine in our car? What effect will automation have on people? How can the Puritan Work Ethic be resolved with the concept of increasing leisure time? These and similar questions must be asked – and answered!

Our technology does affect our values. Many social problems today can be associated with the ever-widening gap between our beliefs and values (which we tend to change rather slowly) and our technological advances (which change at a fantastic rate).

As educators, and as human beings, we believe that we should equip our students to learn about their environment and to help to shape and control it.

For industrial arts educators this means that a part of our job is to teach the shaping and control of technology.

The basis of such control must obviously derive from a set of values. The teaching of such values should be a part of the integrated curriculum which includes industrial arts. In the March issue of the Phi Delta Kappan, Harold Shane, in an article entitled "The Renaissance of Early Childhood Education", says:

"But absorbing information input is only one aspect of the many decision-making tasks with which tomorrow is already confronting us. There is the equally important matter of value-input. The young children with whom we are concerned in many instances will spend the larger part of their lives in a new century.

"As we study innovations we must ask ourselves as often as necessary the questions: For what kind of a world are we preparing our children and, in view of current trends, does it promise to be a good world? If not, what can we do through our policy decisions to shape society so that tomorrow will be better?

"Let us begin our contemplation of programs for the youngest by first sweeping away some of the intellectual smog that continues to obscure many of our goals. The projects we initiate should be based not just on better knowledge of early childhood but on rationally examined values as well. These are values that should reflect a reasoned quest for a twenty-first century in which life has become more humane and secure, is marked by outreaching friendship for others, and is less confused and violent than the era through which we have been groping our way."

Dr. Weber is on the faculty at Millersville (Pennsylvania) State College.

Introducing children to the concepts of mass production

Wayne A. Wonacott

During the fall semester of 1968, seven teachers of grades four and five carried on industrial arts projects involving mass production techniques experimenting with a variety of innovations intended to add to the fund of knowledge in this area. One of the primary missions of the industrial arts program in elementary and secondary schools is to give students greater insight into the realities of business, industry and technology. Each of these seven teachers had this in mind as the work progressed.

Many industrial arts teachers have used the cooperative job or the production-assembly line technique to teach industrial methods. Elementary school teachers have also used the factory activity to advantage. However, the elementary school program directed by the regular classroom teacher presents problems that are not faced by the trained industrial arts teacher.

The elementary school teacher, whether male or female, is completely dependent upon resources outside of his own experience to initiate and carry through a manufacturing project. He seldom has an understanding of the basic industries, and the nomenclature of technology has little meaning.

However, most good teachers are open-minded and are quick to see the values of giving children first-hand experiences in industrial methods. What then can be done to involve more elementary teachers in life-like projects? Also, what can be done to give children more meaningful industrial experiences, such as choice of products, product design and planning, factory tooling and engineering?

These questions and problems were considered. Tentative ideas were established, and classes were selected to carry out these ideas. We found teachers who were willing to carry on the various projects. After some cooperative planning between the teacher and the supervisor, the projects were all initiated and then evaluated.

Mrs. Akiyama, Dayton Heights Elementary School, Grade Four:

Purpose: To determine the merits of first giving children a simple product to mass-produce as a motivating experience.

The Product: A Toy Ship

The product has three parts: The hull, a cabin and a funnel. The ship can be made with 10-12 workers.

Class Organization: The class had more than thirty children, so three separate factories of 10-12 workers were organized for work competing with one another. Each factory grouping was to build about 15 boats.

Procedure: The tool operations that were necessary to construct the boat were demonstrated to the class. A foreman was selected for each factory, and workers for each operation were chosen. The workers of each of the three factories were allowed to determine for themselves the flow of materials.

Results: Each factory grouping of children constructed 12-18 boats. At first, the groups were disorganized and there seemed to be little teamwork. After some discussion and problem-solving the concept began to be understood. Production increased as each member of the group realized his part in the operation.

Second Experience: A week or so later the class made another product. This was another easy-to-build product, but it involved additional tool operations.

Product: Note Holder

Materials: Clothespin, hanger wire, wooden base

Results: The children knew how to organize. The work progressed at a better pace, and the workmanship was slightly improved. The beginning experience was worth the time and the effort. The total time for both products was four class hours.

Mr. Pratt, 5th Grade, Euclid Avenue Elementary School

Purpose: To utilize the simple product to motivate and organize the class for work on a more complicated product to be produced later.

Simple Product: Toy Boat

Organization: The class produced toy boats in the same manner as the previous class.

Second Experience: About a month later the class produced a teaching accessory for the school.

Product: A Table Chart Rack

Results: The class produced more than forty chart racks, and they were distributed to other classes throughout the school. The beginning experience with the simple product seemed to motivate the children, and gave them the skills to produce a more difficult product.

Mrs. Mizrahi, 5th Grade, Van Gogh Avenue Elementary School

Purpose: To test the value of an instructional package (kit) containing instructions and enough supplies for an entire class to carry out the boat production activity. The kit was issued to the teacher without a supervisory visit or a class demonstration.

Results: Because the product was simple and the instructions were likewise easy, the teacher and the class were able to organize themselves, and they were able to produce enough products to successfully complete the job. The self-contained kit is a possible means of helping teachers initiate projects without outside assistance.

Miss DuRoff, 5th Grade, Van Ness Avenue Elementary School
Mrs. Hofstadt, 5th Grade, Van Gogh Avenue Elementary School
(Both teachers did the same project at about the same time.)

Purpose: To give girls and boys the experience of both designing a useful product and planning the mass production of the selected prototype.

Organization: The children were given the role of being engineers or designers in a toy factory. Each child was given the responsibility of designing a toy boat. However, the design was to conform to the following criteria:

(a) The toy boat should be of interest to a child of 4 to 6 years of age.
(b) The product should be constructed of wood from a given assortment of sizes.
(c) The product should be limited to six or seven pieces of lumber.
(d) The product should be no longer than nine inches.
(e) The product is to be painted with a maximum of three colors.

Upon completion the boats were displayed and the designing staff (class) selected the prototype.

The second phase of the organization was the mass production of the selected product. The boys and girls had the opportunity of planning the production line, and then they participated in the factory operation.

Results: The children seemed to learn a great deal from the experience of being responsible for designing a product for a specific market and then planning for the mass production of the product. Each class produced about fifty products, and one class donated their boats to Children's Hospital.

Mrs. Beale, 5th Grade, Sierra Park Elementary School

This class mass-produced crayon boxes for their school during the fall semester. At Christmastime the children decided to make more crayon boxes for Children's Hospital. The second run of products took less time due to the previous experience. They raised the money to buy the crayons and made special wrapping paper for the gifts.

Mrs. Zeigan, 4th Grade, Hammel Street Elementary School

These fourth-grade children mass-produced the looms on which they wove colorful pot holders for Christmas gifts. The loom frames were a two-piece lamination of 1/2-x 1-1/2-inch lumber, making possible an easy lap joint and giving added strength for the nineteen nails that were driven into each side of the frame.

The project was successfully carried out, but there was a bottleneck when it came time to drive 76 nails into each of the 25 frames.

We are interested in giving children more experiences that are life-like and give insight into our industrial civilization. Therefore, we would be interested in corresponding with anyone who might have ideas or experiences dealing with the area of mass production and manufacturing that may help us accomplish our goal.

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Construction in the elementary school curriculum

Vincent W. Dresser

There seems to be general agreement among educators that a unit in construction should be included in the elementary school program. The extent of exploration, the content to be included, the method of instruction to be employed, the time allotment devoted to the study of related occupations, the mathematical and reading materials necesary to effect a meaningful learning experience for youngsters studying such a unit, are still open to further discussion and experimentation.

In selecting course content for such a unit, it is unrealistic to expect the elementary school teacher to have sufficient background experience or information of the area of construction to be solely responsible for the selection of appropriate material for inclusion in this unit. The importance of adequate teacher preparation for competent instruction in this area cannot be overemphasized. Casual observation of a building or bridge under construction or the exposure to a course devoted primarily to the making of book shelves or ashtrays does not qualify one to lead a group of elementary school students in a unit on construction. The teacher responsible for directing such a program must be aware of the basic principles underlying the application and arrangement of materials used in construction. Without such knowledge the necessary student activities needed to reinforce the learning experiences associated with the unit will not effectively achieve the desired objectives which justify the teaching of such a unit. The elementary school teacher, if a woman, must not consider it masculine or non-academic to possess a basic knowledge of current building practices.

An advisory committee composed of people knowledgeable in the building trades, trade unions and those officials responsible for establishing and enforcing local building codes, along with individuals familiar with living conditions in the area, should be invited to participate in the formulation of suggested course content material. The major responsibility of the elementary school teacher might be to organize such material, adapt it to the appropriate grade level and select activities and related educational materials necessary for complete understanding of the concepts considered essential by the educational specialists and the committee members. Hopefully members of such a committee will be available to serve as visiting experts during the class discussion period relative to their area of expertise. The creativity and imagination which teachers have so ably and effectively demonstrated in their teaching in the elementary school will continue to determine the success of this or any other program. An advisory group may only suggest. The professionals, the elementary school teacher and her associates, will determine the extent to which concepts and understandings are considered to be reasonable expectations of attainment for the students of a particular grade level.

A unit on construction will hopefully involve a study of related occupations. It should be more inclusive than a field trip to the local fire house or a role-playing activity associated with the now-extinct general store. The current responsibilities, level-of-entry preparation and pay scale for general contractors, laborers, engineers, masons, carpenters, steel workers, electricians and draftsmen must be considered, along with occupations just emerging in the labor market.

The possibility of occupation change necessitated by a shift in technology is a factor to be considered when making any occupational choice. The study of occupations may well include some appreciation of supply and demand in the labor market as indicated by reference to the classified section for employment opportunities as published in local and leading newspapers. Teachers are generally proficient in the area of educational guidance relative to the professions but less knowledgeable of the level-of-entry skills required for employment in the skilled occupations.

At this point, for clarification, it might be well to detail a segment of the proposed construction unit which may be included early in the learning experience. No attempt will be made to reduce the content material to any particular grade level of the elementary school. This, along with selected related subject matter content, can best be done by the elementary school specialists.

The assignment might be entitled "Stresses Placed on Load-Bearing Members used in Construction Which Act to Distort the Member". The basic stresses to be discussed will be horizontal and vertical deflection, compression, tension, shear and torque. Load-bearing member refers to the skeleton of the building structure which is designed to carry the live loads and dead loads which the structure must support. Live loads are considered people and equipment. Dead loads are concerned with the weight of the materials which form the structure and the load imposed by the elements such as snow and wind on the structure.

From this learning experience it is hoped that students will be able to identify and understand how load-bearing members in a structure are selected and positioned in the structure so that they will support maximum loads, be of minimum size yet safely perform the function for which they are designed. The ability of building materials to support weight depends upon the nature of the material used and the direction in which a force is applied. This may be demonstrated by using two wood members to serve as vertical walls of a structure separated by a distance of some ten or twelve inches. This distance between the walls is identified as the span. Horizontally across the span place a wood member of rectangular cross-section 1/4- x 1/2-inch, sufficiently long to rest upon the supporting walls. Position this, the beam, so that the 1/2-inch dimension is resting on the supporting walls. In the approximate center of this beam hang a load such as a two-ounce fishing sinker. Note the sag in the beam. This represents horizontal deflection. Increase or decrease the span between the supporting walls. Note the change in the amount of horizontal deflection of the beam relative to the change in the span. Deflection for a given load is directly proportional to the span. Change the position of the horizontal member so that the 1/4-inch dimension rests on the supporting walls. Impose the same load on the horizontal member. Note the decrease in horizontal deflection. The load which a given structural member can support, span remaining constant, is directly proportional to the square of the dimension acting to support the load. In this case the 1/2-inch dimension is twice the 1/4-inch dimension. Thus two squared equals four, which indicates that in the second position the beam is capable of supporting four times as much weight as when tested initially. Thus horizontal load-bearing members of rectangular cross-section are positioned so that their larger dimension is vertical. Note floor joists found in the conventional dwelling by observing their position from the basement view. Compare different kinds of wood as well as other materials in their ability to support horizontal loads across equal spans under similar loaded conditions.

Discuss and demonstrate the other stresses to which load-bearing materials are subjected. Relate these to student experiences. The sections of the walls in the above demonstration directly under the beam are in compression. Any bowing of these load-bearing members will be known as vertical deflection. Place soft modeling clay or putty under a weight. Note the ability of these materials to resist compression. Determine the force acting on the string supporting the fishing sinker. This tends to lengthen the string and places this load-bearing member in tension. A rubber band may be used to support the weight as an illustration of tension acting on the string. The portion of the beam immediately adjacent to the inside edge of the supporting walls has a tendency to be pinched off. This cutting force or shear may well be demonstrated by using the scissors (shears) to cut or shear paper. A common hole in two flat wood members may be filled with clay or putty, then the members may be slid past each other. The clay placed in the holes joining the wood stock will be sheared. Rivets, bolts, nails, screws, welds and similar fastening devices used in construction are subjected to the stresses of shear and tension. Torque is the twisting force which the structural member must resist. It may be caused by wind, movement of the live loads, or by transmission of rotary motion. This is the force applied to a pencil held stationary while it is being re-sharpened in the conventional pencil sharpener.

All load-bearing materials do not have equal ability to oppose these basic stresses. Some may have great strength to resist one form of stress but be relatively weak when required to oppose other stresses. Concrete, for example, has the advantage of being easily molded, relatively inexpensive, and possesses a high resistance to compression but is extremely weak in horizontal deflection. Steel, on the other hand, is a structural material which has the ability to oppose all stresses. Even steel, however, cannot support all loads equally well. While being superior to other materials, it is weakest when called upon to support horizontal loads. Structures are designed so that the materials used for supporting members will be placed in positions in which the material exhibits the greatest opposition to the basic stresses. The high resistance of steel to the stresses of tension and compression are well utilized in the conventional bridge seemingly composed of many triangles. These steel members are periodically subjected to the stress of compression and tension as vehicles move across its surface. The ends of the bridge and the footings of buildings are set in concrete, a mixture of construction materials which has a high resistence to compression. Bridges are often higher in the center than at the ends. In order for the bridge to sag (fail in horizontal deflection), the ends, supported in concrete, must push out or the steel horizontal member must compress. Many bridges are of the suspension type. Uniformly-spaced steel rods suspended from a large steel-stranded cable draped across vertical steel towers whose ends are imbedded in concrete are used to carry the load of bridge roadways. The suspended rods and the cable are in tension, the vertical towers in compression.

Structural materials are often used in combinations. Thus two or more materials which possess different abilities to resist multi-acting forces may be combined. A reinforced concrete beam may well illustrate such a load-bearing structure. Such a beam required to support a load horizontally may be examined. In order for such a beam to fail in horizontal deflection, the part of the beam above the center must compress or the section below the center in tension must split and open. Since concrete has great resistance to compression, we need not be concerned for structural failure due to compression of the top section of the beam. Concrete, however, as already mentioned has little ability to oppose the force of tension. This is the critical section. Steel, however, has tremendous ability to resist the stress of tension. For this reason steel rods are placed in the lower section of concrete beams. The ends of reinforced concrete beams are marked so that when they are positioned in the structure the steel rods can be located in the lower half section.

Concrete is a combination of building materials composed of sand, crushed stone, cement and water. The ratios of these materials may be changed to suit the function of the structure. The only substance which must not be varied in the mixture of concrete is water. This must be carefully controlled. Too much water will substantially weaken the ultimate strength of the concrete. This is the reason for the slump test which is conducted at many building projects prior to pouring. An increase in drying time will also decidedly increase concrete strength. This accounts for the retention of concrete forms, the application of straw on concrete surfaces, and the wetting of concrete after the material has set. Concrete poured under water has ideal environmental conditions. Concrete poured under freezing conditions must include a non-freezing agent mixed with the water content.

The above detailed assignment, only a segment of a unit on construction, will serve to illustrate the kind of information which may be included in learning programs devoted to construction. Student activities may involve the building of model structures such as buildings and bridges. These may be subjected to load test after completion. One or more students may combine their efforts in the production of such projects. Some may vary the mixture of concrete to be poured in mailing tubes or other forms or some may include steel wire in their beams. These can later be tested using a standard span and a varying load. The study of the occupations and professions associated with these responsibilities may be analyzed. The need for adequate plannings and designing should be emphasized. A complete study of such an assignment requires much related math and reading materials. Such a unit, however, may provide additional motivation for these related studies. Many additional topics are needed to provide the student with a reasonable understanding of the broad field of construction as it is currently operating. Construction is as much concerned with bridges and buildings as it is with shops, trains, airplanes and space travel. Many structures have skeletons. An equal number, primarily in this area of transportation, have a combination of skeleton structures and skin strength. The transition from the fabric covering to the aluminum epidermis in modern aircrafts is an illustration of this trend. Additional topics to be studied in the unit on construction along with related occupations may include site selection, measuring instruments, construction plans, foundations, prefabricated building materials, insulation, air conditioning, heating, plumbing, landscaping, earth moving equipment, etc. Historical study of man's building progress should be included. It may extend from the caveman dwelling to the structure of the vehicle used in the recent moon flight. There are commonalities. There are basic laws of physics involved. The occupations of men concerned with such structures are ever-changing, but these basic principles continue to serve as guidelines for structures yet unborn.

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special education

Industrial arts as therapeutic education for the mentally retarded

James J. Buffer

It is gratifying to be able to talk before a group of industrial arts educators who, by your presence at this meeting, give evidence of an interest in assisting with the educational growth and development of the mentally retarded through industrial arts instructional programs. Too often, industrial arts teachers do anything professionally possible to convince their administrators and guidance personnel that retarded youngsters do not belong in the laboratories. Having taught retarded children in both the special classroom as well as the industrial arts laboratory, I can well understand and appreciate the fears, frustrations and problems that the industrial arts teacher (or any other school teacher) experiences when confronted with a class of retarded children.

Although a number of problematic questions are posed by the industrial arts teacher, they can be generalized in this statement: "What can I, as a professional teacher, do to help improve the educational and social competencies of retarded children to help them to become self-sufficient and productive citizens in our advancing technological society?"

Marshall Schmitt's national survey of the status of industrial arts reported that most of the students enrolled in industrial arts come from the lower 75% ability levels. Masters' studies conducted by Adams, Caley, Pohlhammer and Wasilewski reported that those students enrolled in industrial arts at the secondary level tend to have lower scholastic aptitude and achievement levels than non-industrial arts students. Their findings suggest that industrial arts programs are primarily serving the student with less than average scholastic capabilities.

Often it is a practice, especially in large schools, for the industrial arts teachers to rotate the responsibility of teaching the retarded. Generally industrial arts teachers do not want to teach the retarded because: (1) they lacked the special professional training necessary to be successful and/or (2) they lacked the desire or interest to work with retarded children.

The large number of slow learners and retarded children that are enrolled in industrial arts courses are not achieving optimal educational benefits. The problems listed above by the industrial arts teachers are two of the contributing factors. A third factor is that there is a lack of appropriate curricula and instructional materials for the slow learner. Often the only adjustment made in the typical industrial arts shop to accommodate the special needs of retardates is to require fewer projects, use primary hand tools, lower expectations of craftsmanship on projects, and require less reading and paper work.

Up to this point, I have been using the two terms "slow learner" and "retarded learner" together. I am well aware that these terms are merely convenient methods of classifying people according to their "ability" to be successful in educational pursuits and achieve social competency. Retardates are generally rated or classified using multiple criteria – such as measured intelligence (IQ), adaptive behavior and physical maturation. Using current standards, one in five children is a slow learner (about 8 million) with an IQ falling somewhere in the range of 70 to 90. Three percent of the population (about 4-1/2 million) are listed as mildly or educable mentally retarded (EMR) and have an IQ within the range of 50 to 70. Most of the retarded children enrolled in the public schools are EMR, although a smaller percentage are moderately retarded (trainable mentally retarded – TMR) with IQ's of 30 to 50.

Since our society is becoming more complex as a result of technological developments, the level of intelligence and education required for self-sufficiency has drastically increased. This phenomenon has caused the National Association for Mental Retardation to set the borderline for mental retardation at only one standard deviation below the mean – an IQ of 85. The principle reason for this change is that today's individuals with IQ's below 85 seem less competent in getting along than was the case in former generations (Jensen pp 1-2). Therefore, for purposes of my discussion, I am referring to those whose IQ is between 50 and 85 (over 12-1/2 million), the greater portion of students with educational and social deficiencies who are enrolled in public schools.

Motor activities and learning. Recently, an increased interest in the role that motor activities have upon intelligence and achievement has become evident. The work of Doman and Delacato has received praise as well as extreme criticism from the medical and educational profession. Anecdotal reports in the mass media and from lay people who have attended the Institutes for Human Potential in Philadelphia describing the successes of the therapy tend to excite one's interest in the area with its implications for remediation in education. Unfortunately, the dearth of empirical evidence available for review by the profession prevents us from making any judgments regarding the validity of their clinical work. However, the research of Kephart, Piaget, Cratty, and others have also attested to the benefits of motor activities as a helpful learning modality.

Bryant J. Cratty, director of perceptual-motor research at the University of California (LA), reports on research which reflects interactions between visual perception and motor activities. He lists four reasons that led education in recent years to place perceptual-motor tasks in special programs for retarded youth:

(1) Social acceptance and self-acceptance are enhanced if a child's ability to participate in games, given status by his peers, is improved. A general need for achievement is heightened after successful participation in games.

(2) Many initial concepts formed by children and infants are gained through movement experiences. A child whose thought processes are inexact may lack certain developmental underpinnings which involve perceptual-motor behavior. An adequate perception of the body, its various dimensions and parts, may be related to the ability to organize space, to read, to spell and to write.

(3) Certain components of classroom learning may be improved through pupil participation in carefully-planned physical activities. Remembering the order of a series of actions of a planned obstacle course, for example, offers the child practice in organizing components of a series of letters when dealing with words. Gross motor activities, if properly apportioned, may aid the hyperactive child to focus attention on various tasks for increasingly longer periods of time.

(4) Requesting children to think about and to demonstrate ways in which they might modify the performance of a task and presenting them with opportunities to invent games, represents experiences which should enhance creative thinking and problem-solving activities. (pp. 192-3)

The child with perceptual motor problems has trouble with educational processes and achievement. Based on research studies, synthesized by Cratty (1969), these children can be helped by:

(1) Improving visual-manual skills including tasks involving finger dexterity, hand-eye coordinations similar to writing, and tasks to aid them to perceive their hands and fingers.

(2) Simple muscular tension improved performance of mental skills (verbal-cognitive skills).

(3) Active participation in learning games improved language skill development.

(4) Achievement of success in games and play has a carry-over in classroom endeavor; whereas repeated failure in games involving perceptual-motor tasks caused a decline in ability.

(5) Prolonged attention (increased gradually) in a motor task improved concentration in classroom.

(6) Gross movement, as a learning modality, depends on combination of sensory input, visual, kinesthetic and tactile – improves spelling and numerical abilities.

(7) Pattern shape recognition – triangles, squares, rectangles, half-circles: helpful in formation of basic perceptions underlying letter and word recognition and reading. Also helps child to become aware of gross and subtle things about his environment.

A review of the studies involving EMR children indicated that the general mental abilities of the children improved after participation in special activity programs designed to improve motor ability. An analysis of the data suggests that these outcomes might be the result of a genealogical effect on improvement in one's perception of self. A general improvement in achievement performance – improved self-concept – improves subsequent performance. This cycle may well work in reverse. Remember Pavlov's classical study of the dogs who, when attempting to extinct a learned response, failed to receive expected reinforcement when the stimuli elicited a response, and suffered what Pavlov called "experimental neurosis" and "conditioned inhibition."

When dogs that were conditioned were put on extinction schedules – withholding of reinforcements – some especially were forced to learn sensory discrimination beyond their sensory abilities. Conditions led to "conditioned inhibition" and "experimental neurosis." (Pavlov)

The school environment for many children may create conditioned inhibitions which, in turn, become aversive stimuli. The resultant behavior of children – inattentiveness, aimless hyperactivity, and active resistance to learning – are symptomatic of Pavlov's experimental neurosis.

We know that repeated inappropriate and unrewarding experiences may create conditioned inhibition in children who ordinarily would be able to achieve educational success in an appropriate school environment. Bruno Bettleheim suggested that many children are institutionalized as wards of society because of such inappropriate experiences in early years. We are aware that it costs millions of dollars for institutional care; whereas, they could become productive taxpaying citizens. The research of Samuel Kirk, Kephart and many others have found that an enriched, stimulating and active learning environment (home, community and school) all contribute to the phenomenal increase of mental abilities as measured by our traditional intelligence instruments.

Role of industrial arts. Industrial arts has a rich tradition of serving the educational needs of the slow learner. As early as 1890, Dr. Calvin M. Woodward suggested that those students who were slow of speech and had poor memories could achieve scholarly results in shopwork and drawing. He felt that a firm hand was more important for achieving success in technical education than fluent speech. Woodward was also one of the first educators to "suggest" that shopwork has a therapeutic effect on dull learners. He suggested that after realizing their ability to be successful in shopwork, their ambition and aspirations would be aroused and dormant power would be awakened (Woodward, 1890).

It would be difficult to find educators today who would attribute an expected change of behavior to the exercising and development of certain mental faculties as previously accepted in theories of learning based on faculty psychology. Perhaps a more acceptable position would be that successful achievement in the shop has a positive impact upon the student's self-perceptions and, also, upon his subsequent achievement motivation.

Just what can industrial arts do to help "educate" retarded children? A review of our literature will show articles and books suggesting the study of crafts for recreational and leisure time activities or suggest an emphasis on vocational preparation.

It is necessary that we clarify our thinking regarding the function of industrial arts education for all youth. It is generally accepted that industrial arts programs serve the following educational and social functions for children:

(1) General Education--provides children with an understanding of industry and its impact on social and cultural conditions.
(2) Vocational--provides exploratory experiences with a variety of industrial tools, materials, processes and skill development.
(3) A third function that should be listed is therapeutic. Industrial arts experiences provide most children with the opportunity to (1) develop perceptual-motor behavior, (2) develop multi and integrative sensory-motor skills, (3) experience success in a school activity, (4) have freedom of movement in a laboratory, (5) interact with peers to achieve common goals, (6) experience leadership and followship activities, (7) deal with concrete materials rather than sole dependence on abstract reasoning, (8) participate in action-oriented, game-like activities with immediate goal satisfaction, and (9) study concepts that have immediate application to their environmental and personal needs.

It is assumed that an industrial arts program that truly represents a study of industrial technology – how man changes the shape and form of raw materials to meet his material needs – can provide educational experiences to help all children achieve the three listed functions. It is further assumed that industrial arts can be developed which may serve as a means of modifying the retardates':

(1) Educational Achievement
    a. language development
    b. number concepts
(2) Social Competency
    a. occupational
    b. social behavior
(3) Intelligence
    a. IQ
    b. general school performance
(4) Physical
    a. coordination (hand-eye)
    b. sensory performance.

Retarded children have been conditioned to "expect" failure in educational activities. Industrial arts programs must be structured to provide educational experiences that will enable retarded children to achieve success and modify their "failure syndrome."

A report of an industrial arts unit which was developed in part to achieve this goal, as well as meet the three stated functions of industrial arts, may be found in the October, 1969, issue of IA/VE.

The developmental work of the Industrial Arts Curriculum Project (IACP) has also contributed to the production of an instructional program that serves these three functions. The success that retarded children are having in the IACP program lends further evidence that industrial arts instruction can have a positive impact upon the educational and social development of children with learning disabilities.

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The University Hospital School

Ronald E. Lough

The University Hospital School is one of few facilities of its kind that is administered by a great university. Major ongoing activities in this facility are concerned with the following objectives: (1) To provide a program of education, care and treatment for selected children who can be educated or trained, but who are so severely involved physically that they cannot receive an adequate program in their home community, and for selected children who are retarded mentally; (2) To utilize this program as a means for providing specialized training for prospective workers (many being university students) in various professional fields concerned with physically handicapped or mentally retarded individuals; (3) To foster research through this program pertaining to causes, prevention and management of handicapping conditions (particularly in pre-adults) which result in major deficits in functioning.

Four separate administrative units are housed in the University Hospital School building. One of these units is composed of two sections which operate under the Director of the University Hospital School. These two sections, about which major emphasis is given in this presentation, are known as the Children's Rehabilitation Section and the Pine School Section.

The Children's Rehabilitation Section of the University Hospital School may provide treatment and education for children whose physical handicapping condition makes it impractical for them to attend or to progress in their local school and community. The aim is to rehabilitate these children sufficiently through special education and treatment so that eventually they may return to their home community or the continuance of appropriate management. Residential-type care in this facility is provided for 60 children at a given time. A comprehensive program of special help is available in the field of medical, dental and nursing care; communication skills; various therapies; special education; physical education; industrial arts; homemaking; music; and child development. Thorough initial and recurrent evaluations of handicapped children are provided on an outpatient basis prior to admission of the child to this section. Through this activity an attempt is made to give parents pertinent instructions regarding care of their child at home and to focus attention on all of the child's malfunctioning, insofar as possible.

The Pine School Section provides a special educational and training service program for selected children who are mentally retarded from preschool through adolescent ages, who live in the surrounding geographical area. The school aspect of this program operates under joint agreements, (a) one between the Iowa City Community School District, and (b) another between the County Board of Education, with the University of Iowa's Board of Regents on behalf of the University Hospital School. Attendance in the Pine School Section is on a day basis only. Children in this section live at home and are transported daily to and from the University Hospital School. Formal classroom programs of the Pine School Section extend through the elementary school grade level for mentally retarded at the educable level.

The initial appraisal for consideration of admission of elementary-school-level children to the Pine School Section is made in the public school by psychologists and special education staff of the Iowa City Community School District. Subsequently, up to 75 children are accepted for admission to the Pine School Section because of their poor progress in the regular classroom on the basis of lowered intellectual functioning. Also, approximately 15 preschool-aged children with mental retardation and nine older children having mental retardation at the trainable level were admitted to the Pine School Section beginning in the fall of 1967. These older children at the trainable level had previously attended the Nelson School, operated under the auspices of the Johnson County Association for the Retarded.

A different policy is followed in determining acceptability of children to the Children's Rehabilitation Section. The following admission procedure is followed in such situations: (a) outpatient appraisal of each child at the University Hospital School to determine his acceptability status, (b) consideration by an Admissions Committee pertaining to the child's condition and needs for this residential type program, and (c) admission of those who are acceptable when availability of bed space and other program commitments permit.

The major factors considered by the Admissions Committee of the Children's Rehabilitation Section in determining acceptability status of each child are as follows:

(a) Need for this hospital school-type service.
(b) Educability status.
(c) Prognosis regarding physical habilitation or rehabilitation.
(d) Degree of physical severity.
(e) Lack of availability of needed services in the home community.
(f) Length of time formal application has been on file.

There are several notable objectives fulfilled by offering industrial arts in special education for the physically handicapped and mentally retarded. Four of the more important ones are: (1) to familiarize the students with tools, hobbies and possible vocational interests; (2) to develop an appreciation of good workmanship, cost of materials, quality and procedures; (3) to have direct reinforcement of different therapies and classroom activities; and (4) to develop a sense of responsibility.

Major areas of activities include woodwork, metalwork, graphic arts, photography and electricity. Children also receive instruction in ceramics, leather, plastics, weaving and other craft areas. So that each person can experience success, regardless of his handicap, a wide variety of activities is offered.

Industrial arts instruction is offered to children with physical disabilities including: cerebral palsy, multiple congenital anomalies, arthrogryposis, poliomyelitis, muscular dystrophy, spina bifida, osteogenesis imperfecta, and other conditions. Various students may pose different problems although their medical diagnosis may be the same. Frequently, individual instruction is necessary and the curriculum must be modified due to physical limitations of the handicapped. Special equipment is constructed for some children, enabling them to carry out operations that would ordinarily be impossible. For example, electric jig-saws are mounted on dental chair bases allowing them to be raised and lowered for individual needs. An adaptation such as this is necessary for the physically limited child who must remain in a sitting position for project work.

A leather jig is a supporting device that holds a metal pounding tool in place as the person strikes it. This in turn makes an impression in the leather. Special equipment such as this enables the student to concentrate only on striking the pounding tool and not on positioning it and the leather.

A stand-up board is sometimes used for those who cannot stand alone. The student feels more secure in a device such as this and therefore can concentrate more on the project work.

Project selection for the child with a handicap must be on an individual basis. They progress through as many areas as their handicap permits. Most of those with physical disabilities are limited in industrial arts; therefore, the program must be adapted. One of the most important aspects in the treatment of the handicapped person is to discover his potential and develop special abilities.

The majority of the Pine School children that are involved in the industrial arts program are educable mentally retarded and vary in age from five to fifteen. The special class of trainable mentally retarded young people also participate in the industrial arts area. The chronological age range of this group is 12-18. The educable mentally retarded are offered instruction in most areas, with project selection moving from the simple to the complex. Each child moves through a series of projects in one area. For example, in the woodworking unit they will be introduced to project selection at the following four progressive levels of achievement:

Level I. Free-cutting on soft wood or masonite with a coping or panel saw is expected at this level. Hammers, nails and glue are made available for assembly. At this time the instructor has no purposeful project in mind. He is acquainting the student with hand tools and establishing rapport.

Level II. Free-cutting or cutting along a line is used at this stage. This type of work requires no sanding and only limited finishing procedures. A project idea would be an attractive picture glued onto a piece of 8 x 10-inch masonite. The end result at this level is the child being able to produce a picture puzzle by cutting irregularly-shaped lines with a coping saw similar to those in a jig-saw puzzle.

Level III. At this stage the child must follow a line with the electric jig-saw or coping saw. Other procedures are then introduced, such as filing, sanding and painting. Projects are becoming more meaningful to the children at this time. Interest and motivation are increasing, as they are now beginning to realize some degree of accomplishment.

Level IV. The child is now able to cut accurately with both types of saws, and use hand tools effectively. Attention span and motivation must be developed at this point. He is further introduced to fine cutting, fine sanding, gluing, wood filler, stain, varnish, steel wool and wax.

Other allied areas, such as electricity, metalwork and graphic arts, are constituted by similar levels of accomplishment.

Motivation and interest have been found to be extremely high with educable mentally retarded children in the University Hospital School. The projects they are capable of producing are very pleasing for them and their parents. The children take home objects of which they are proud, hence the development of parental pride frequently occurs.

Industrial Arts Work-Study Program. Until November, 1968, the University Hospital School Rehabilitation Section concentrated its activities in the education and therapeutic treatment of nursery-, preschool- and elementary-age children. It became apparent that there was also a need in serving the physically handicapped adolescent and young adult. To fulfill this need, an expanded program was developed to offer not only education and therapy to the younger student, but emphasized other activities for young adults. This included evaluation, training, vocational planning and community placement. When the older group is admitted to the residential program, they are tentatively classified in one of two groups – academic or nonacademic. The academic section pursues in large measure an educational program supplemented with individual therapy sessions. Emphasis for the nonacademic young adult is a concentrated work-study program with adapted education to facilitate job training. This latter group becomes involved through the Industrial Arts Work-Study Program and are assigned job tasks within the Hospital School. At this time, the Iowa City Vocational Rehabilitation Agency often becomes involved in the planning and establishes a vocational file on the client. These records are kept open and may be transferred to local communities when the client returns home. It is through the Iowa City Rehabilitation Agency that some of these young people are placed in Iowa City community resources. This placement, at the present time, is either at the Goodwill Industries of Southeast Iowa and/or at a vocational evaluation center located within the University of Iowa. Because the physically handicapped client will eventually return to his local community and not remain in the Iowa City area, concern is more directly involved with proper evaluation and assessment of the individual's abilities rather than the actual placement in Iowa City businesses. When assessing the client's abilities, his local community is taken into consideration and employment ideas are geared to the availability of jobs at home.

The trainable mentally retarded population in the Pine School Section also participate in the Industrial Arts Work-Study Program. Most of their job activity is concentrated within the Hospital School; however, placement at Goodwill Industries is possible in some instances through cooperative action by the Vocational Rehabilitation Agency. One of the main objectives in offering a work-study program to these young persons is that it will hopefully act as an intermediate step between a structured training program and home or sheltered placement. For those participating in the work-study program, many different types of jobs are available in the Hospital School area for trial placement. The department supervisors are responsible for submitting different work tasks available in their respective areas. All areas, including nutrition, housekeeping, nursing, physical therapy, occupational therapy, recreation, science and music, contribute in the development and creation of jobs. From these work-task applications, job placements are made in the areas, dependent on abilities of the applicant and the complexity of the job.

The importance of a well-planned industrial arts and work-study program in special education should be stressed. Many children with handicaps can benefit to some extent. Results vary from merely educational observation to a possible vocational interest. It is the instructor's responsibility to offer a program that provides these needed experiences in the lives of physically handicapped and mentally retarded children.

When industrial arts is developed to its fullest potential, it directly reinforces the educational and various other aspects of the individual's total program. Classroom activities and allied therapy become more meaningful to the children when the two areas work in conjunction. If educators are concerned about these children in "special education" to the fullest extent, industrial arts should assume a major role in programming.

Mr. Lough is on the faculty of the University of Iowa, Iowa City.

computer technology

Computer-assisted instruction in industrial arts

Larry Heath

The action today, throughout the educational world, is in individualizing instruction. Robert Magar's Preparing Instructional Objectives has become the standard curriculum builder's handbook. Computer-assisted instruction is one of the hottest topics in education today.

Just what is computer-assisted instruction, or, as it is more commonly referred to, "CAI"? The underlying concept to CAI is that each child learns as an individual. He learns at his own rate and through his own set of experiences. With this concept in mind, any group instruction is something less than perfect for each individual in the group. There is always a compromise. CAI is a technique for providing individualized instruction with considerable assistance from a computer.

In more practical terms CAI is a computer system with some type of student response system, usually a teletype. The teletype prints out information and questions and the student responds. New information and questions are provided based on an analysis of the student's response to previous answers. Because of the computer's high speed and large memory, many different instructional programs can be provided for students, each with different learning patterns in essentially similar curriculum.

Today I would like to tell you about a specific CAI experiment that was conducted in an industrial arts high school program. Then I would like to expand the topic slightly and explore a general model of how CAI might be used in industrial arts and how computers can and should be used.

Corvallis High School, in Corvallis, Oregon, cooperated with Oregon State University in a pilot program that had two major objectives:

(1) To implement and evaluate the CDC 3300 computer, in a CAI role in a regular high school.

(2) To evaluate a software program that was developed to teach high school students basic electronics with CAI.

Before I reveal all of the computer-assisted instruction program to you, I'd like to throw in a couple of disclaimers. This program was a first attempt and does not fit all of the design criteria that I would establish now. But I guess the reason we do research is to learn.

The program at Corvallis High School was designed to have the students build a Graymark 504 transistor amplifier kit and to learn parts identification, soldering techniques, current, voltage and resistance measurement techniques and to be able to solve basic series and parallel circuit problems. The computer at Oregon State University, a Control Data Corporation 3300, was used for the project. The computer was connected to the high school over telephone lines just like the teletype.

The instructional materials used for the program include a student manual that contains the written behavioral objectives, pictures to be used at various steps in the program and other necessary diagrams. The text was used as the basic source of instructional frames. The materials used were modified to fit the specific needs of this program. There is also an experimentation board for setting up the circuit, slides and some transparencies. All of these materials were used in conjunction with the computer so that a coordinated, complete instructional package was developed.

The actual instructional process went something like this. Each student was assigned a student number (between 1 and 100). To begin the instruction each student typed his number on the teletype. Then the following sequence would occur:

1. READ OBJECTIVES PAGE I IN MANUAL. SEE SLIDE I
2. OBJECTIVES UNIT I.
   - A. TO BUILD A WORKING MODEL OF AN INTERCOM AMPLIFIER
   - B. TO IDENTIFY, DIFFERENTIATE, LIST AND COMPARE COMPONENTS WITH MODEL OF 504 INTERCOM AMPLIFIER.
   - C. YOU WILL BE PROVIDED WITH COMPONENTS MATERIALS AND NECESSARY TECHNICAL DATA TO BUILD THIS AMPLIFIER.
   - D. YOU WILL NOT BE EXPECTED TO EXPLAIN THE OPERATION OF THE AMPLIFIER AT THIS STAGE.

3. OBTAIN AMPLIFIER KIT FROM INSTRUCTOR. NOTE SLIDE 2 & 3.
4. TURN TO PAGE 2 OF MANUAL. CHECK YOUR PARTS AGAINST PARTS LIST. USE MODEL TO HELP IN IDENTIFICATION. BE SURE YOU HAVE ALL PARTS. SEE TRANS. 1 & 2.
5. NOTE EACH RESISTOR SIZE IS INDICATED BY COLOR BANDS ON RESISTOR.
6. TURN TO RESISTOR COLOR CODE CHART PAGE 3 OF MANUAL.

The student is instructed to do something by the computer. He completes his assignment and returns to the teletype. He either has his work evaluated or is simply given new tasks to accomplish. At times the student will have a high percentage of computer interaction. Other times he will be using primarily other materials and only return to the teletype for periodic checking on his progress.

At all times the student is using regular textbooks, machines, even other people, as sources of information and experience.

As a result of the computer control over the instructional process, each student can progress at his own rate, as fast or as slow as he wishes and may even be given considerably different instruction in the same basic course.

The teacher role during this time is that of a consultant. He may now work with individual students and help them when they have problems, because the routine giving of information and assessment of student progress has been taken over by the computer. The teacher becomes a true teacher of students. He is no longer tied to paper-shuffling and student-counting.

A general model for computer-assisted instruction. The major role of the computer in the instructional process should be the directing of learning experiences. It is not practical to have the computer hand out all of the information.

CAI varies from programmed learning in that the responses and the preceding instructions can vary over a wide range of activities. In the normal programmed learning the student is only using paper and pencil.

In a school situation the ideal program could be developed if, accessible to each instructional area, there were a bank of computer terminals. This would allow students to work in their regular rooms, labs or shops and yet use the computer to guide the instruction.

The computer is a powerful tool. In addition to using the machine for CAI, most systems can be used in a wide variety of other ways. The system at Oregon State University is rather typical of most large computing centers.

The OSU center has remote teletypes, video-tape facilities, cathode ray tube response systems, plotters, card readers, card punches and time printers.

On this system you can enter data on the teletype and leave pre-prepared programs, analyze your data and have the results either mailed to you or typed back on the teletype.

The computer, in this case using a system called OSCAR, can do any algebra-type calculations. All you have to do is type in the problem, with data, in a preset format, and the answers are fed back immediately.

Data can be put in from a drafting class and the computer-directed plotter, in the computer, will draw out whatever your data dictates.

Special-purpose computers are also used in machine control such as drilling operations, milling machine operations and even lathe work.

Because of their wide versatility, computers can be used in all kinds of technical tasks. Computers are now becoming less expensive, and the development of time sharing makes computers available to all. The real challenge comes in preparing the instructions for the computer to follow so that the teacher can take full advantage of this marvelous space-age development.

Mr. Heath is on the faculty at Oregon State University, Corvallis.

communications

The industrial arts newsletter

James O. Reynolds

Calling the state association periodical publication a newsletter presumably is to distinguish it from the established magazines and/or publications of a more sophisticated nature. In many cases it is exactly a newsletter mimeographed or otherwise inexpensively produced and promiscuously distributed. However, it need not be so amateurish and unattractive if the officers of the state organization are aggressive enough to organize and promote an essentially significant and pertinent publication.

The mechanics of publishing are relatively simple. The gathering, sorting, editing, etc., of the content is not. The greatest problem to resolve is, "What service do you want it to perform?"

At an adjunctive meeting with the regional NDEA-State Association Officers--Institute, the editors of the state association attending were in agreement that the newsletter should concern itself with involvement, in-service training and items of statewide interest. Ostensibly this covers everyone and how to do it is left to the discretion of the editor. Now while the editor could conceivably write, organize and prepare all of the copy for the newsletter, it would hardly meet any of the criteria set for it, nor would it represent the Association. This is where involvement plays such an important part.

It is not easy to obtain manuscripts or articles from industrial arts people in the field, especially for free. So it becomes necessary as a function of the organization to delegate responsibility to various people to report on the activities in their geographical area. These will arrive in many forms, and the editor will have to function in editing, rewriting, deleting, redating, etc., to create reasonably intelligent copy. Any newsletter article worthy to be included should have:

(A) Purpose,
(B) Effectiveness and
(C) Conciseness.

Another source of involvement is a follow-up of award winners in contests, programs, newspaper articles, radio and TV participation, community activities, etc. Here again the editor must reach out and persuade, since not much of it arrives voluntarily. This sort of news is especially valuable, since the students are also involved.

In-service training: This is probably the greatest function of any industrial arts publication. While the newsletter cannot hope to compete with the major publications in this respect, it is still a mandatory function to include in every issue something that will increase the dimension of the reader, whether it be a philosophical editorial or an analysis of new curriculum guides or programs. This is the easiest of all material to procure. The editor can always fulfill this obligation unless his brain remains dormant past the deadline.

Statewide interest: The newsletter should contain those items affecting all teachers and others involved in:

(A) Meetings of regional and state groups,
(B) Election of officers,
(C) College and university offerings,
(D) Institutes funded,
(E) New approaches to industrial arts,
(F) Legislative action and others that you may think of.

The preceding somewhat fragmentary introduction defines the purpose.

For more practical purposes this should have been a workshop session rather than a formal presentation, and in the event it so becomes, the following list will suggest a number of discussion topics:

(A) Purpose
(B) Definition
(C) Method of reproduction
(D) Make-up
(E) Copy
(F) Advertising
(G) Book reviews
(H) Distribution and,
(I) Cost.

The final analysis of the newsletter will be performed by the recipients, and if you receive a myriad of complaints like "Why in the ---- don't I get my newsletter?", it must be reasonably worthwhile.

Mr. Reynolds is supervisor of Industrial Arts in the Dayton (Ohio) City Schools.

State's industrial arts association newsletter actions

Daniel W. Irvin

The Power Tool Instructor is a Rockwell publication and doesn't quite fit into the topic or subject of this special interest session, but we sincerely hope that we can somehow contribute to the solution of the various problems involving state newsletters.

The Power Tool Instructor was started by the Rockwell Manufacturing Company – at that time located in Milwaukee, Wisconsin – and Volume One, Number One was published in 1950 under the name "Power Tool Journal". For the first couple of years, this publication was not aimed specifically at the school market or intended for teachers, but issued as a general industry publication concerning the use of power tool equipment. In 1951 the name was changed to the Power Tool Instructor, which is the name used today. At that time the format remained relatively the same, but most of the articles and features were then aimed at the educational market or to benefit instructors primarily in industrial arts.

This magazine has been published either three or four times a year every year since 1950 and has gained in popularity as proven by the number of requests we receive for copies. In 1960-61, the complete format was changed, although the name was retained, and this is the Power Tool Instructor as we know it today.

Presently we print about 42,000 copies and publish three times a year – once in the spring, once in the winter and once in the fall. Needless to say, this in the trade would be known as a "house organ", and for your information our costs in producing this publication run between $3,000 and $4,000 per issue, or approximately $12,000 a year. As opposed to many state newsletters, we naturally send this out for both art and printing. The articles and other material as found in this magazine are developed through the efforts of the School Department people at Rockwell Manufacturing Company and are all aimed at the educational market or specifically the industrial arts and vocational or T & I instructor or director. The magazine, of course, is sales promotional by nature, although we make every attempt to keep it on a high professional plane, which insures both acceptance and readership. We feel that by turning it into a purely advertising-type vehicle, we would lose a great deal of interest and, naturally, not benefit as we might expect from the promotional money that we have spent. In a way, you might say that we feel that what is good for industrial arts is good for Rockwell and we, more or less, let the chips fall where they may after that premise.

We make every attempt to obtain articles of interest to industrial arts directors and instructors all over the country covering specific subjects of general interest, opinions, various methods and other material helpful to industrial education. Some of our articles have been written specifically by educators, and we literally give them free rein to say anything which they feel cannot possibly be covered in one of the regular magazines in our field, such as School Shop, IAVE, The Journal of Industrial Arts Education, or the Journal of Vocational Education. We also attempt to include chart material and other information concerning power tools which would relate not only to the brand we manufacture, but also to power tools in general. Most of the ads or space taken which could be considered advertising is really designed to promote the fact that we do have a great many teaching, purchasing and service aids available either at no charge or at our cost. We also use this vehicle to introduce brand-new pieces of equipment as they enter our line, but even then we attempt to keep this direct or specific advertising on products to a reasonable minimum. We do feel, however, that new items are of interest to our readers, even if the vein is slightly commercial.

We actually have four separate mailing lists covering this publication. Number one is a list of various directors, two is college personnel, three is teachers of industrial arts or vocational education and list four is for bulk mailing. For the first two lists mentioned, the address plates indicate both name and title. For the teachers' list, we list titles only, since it is literally impossible to keep up with teachers moving from school to school by name. By using title only, this list remains reasonably accurate, since someone is always the "Woodshop Instructor at Jones Jr. High School". The bulk list is used by some of our distributors, various college and universities, and even by various directors who distribute this internally at their discretion. Colleges often use this magazine as a part of their classroom material or for reference material.

Through the years, we have watched various other publications come and go, sponsored by other manufacturers, and the fact that we are still publishing the Power Tool Instructor pretty well speaks for itself. To the best of my knowledge, except for a few companies such as 3M, there is no other "newsletter" or small magazine like this which is widely circulated nationally among industrial education teachers.

We sincerely feel that this publication is dedicated to good industrial arts education and if we can help even slightly to improve this situation or to further spread good ideas, we are more than willing to spend the time and money in order to help this cause.

As far as state newsletters are concerned, we feel that some premise must be set forth according to the purpose or intended purpose of the newsletter. Very possibly a two-page typewritten letter, merely stapled together, would well serve the cause. In some states the newsletter actually turns out to be a very sophisticated magazine, including quality paper, good pictures and professional articles, as opposed to merely announcements and news.

The decisions concerning size, sophistication, art, printing and other matters, I am sure, depend upon the purpose of the publication and also upon the amount of money which can be budgeted to support this particular project. As far as ads are concerned, these can be sold to various members of the industrial community, although I would highly recommend that, for a state publication, local distributors be contacted first, with national manufacturers who are actually located within that state second. Some state magazines or newsletters tie in their state show to help support their magazine or require anyone buying booth space in the show also to buy space in the magazine. There are thousands of ways in which this can be handled. I would not say I was totally in favor of this "Tie-In" method, but certainly if I was an educator it would make life a lot easier than attempting to actually sell ad space on an issue-by-issue or year-by-year basis. It might be possible to get one manufacturer within a state to support totally a publication or newsletter of this type. I would guess, off-hand, that mention of this support in the newsletter, possibly in a special block at the bottom of the page, would adequately satisfy a great many manufacturers who might fall into this potential category.

I realize that what I have said does not fall into any specific pattern, but certainly if I were directly in charge of a state newsletter, I would set down the details and justify: First of all, why there should be one; second, how big it should be; third, how costly it should be; fourth, who it should be mailed to; fifth, how many times a year we would publish; and naturally a great many other questions – justifying each of those at least in my own mind. This would be done with the object in mind of selling this idea package to the association, to the teachers, and to potential supporters.

We sincerely wish you every success with your various state publications, and if we can be of any assistance, please don't hesitate to let us know. We do not pretend to know all of the answers, but there certainly are a lot of "tricks of the trade" involved in this type of business. Either through our company or through our agency, we can possibly give you some assistance, at least in pre-solving problems or answering questions.

Mr. Irvin is educational director of the Rockwell Manufacturing Company.

Better articulation to industry for dropouts

Sterling D. Peterson

Articulation with industry has been very important for years, but within recent years it has become more important, since national leaders have often said that students should become more involved in industry and experience first-hand real live experiences.

With this thought in mind, educators have made a greater effort to articulate with industry. A procedure used by the Minneapolis Public Schools illustrates this effort very well. Listed below are several techniques used in order to gain better articulation with industry.

How to approach industry. First of all, industry has to become aware of the fact that education wants them to help and need to be informed as to how they can help. In order to accomplish this, Dr. John B. Davis, Superintendent of Schools, held a series of tray luncheon meetings in his office with industrial leaders in the community. Six to eight leaders at a time were invited to come to the School Administration Building, pick up a lunch in the cafeteria and bring it to his office. During this time, these people would be informed concerning school needs and what they could do to help alleviate these needs. After many meetings of this nature, it became much easier to contact the various industries and ask them to support special educational projects designed to help dropout students.

The Urban Coalition, which represents a broad community composed of members from business, labor, church, education, etc., and the Chamber of Commerce, were also informed that the schools needed their help and were willing to work with them.

Presently, plans for a public relations team to be funded through a private foundation are in the development stages. This team, composed of approximately five members, will devote full time to speaking to various industrial groups concerning the needs of the educational system and how industry can help.

School representatives work very closely with the National Alliance of Businessmen, an organization set up to help find jobs for students.

Each industrial arts teacher should volunteer to serve on an education committee of the industry association most closely related to his curriculum area of instruction. By working on special committees, the teacher is able to inform industry how they can assist. For example, the Printing Industry of the Twin Cities, acting on the recommendation of their Education Committee, set up an industry-teacher assistance program. A questionnaire was sent to each teacher asking him to indicate areas of graphic arts where he needed assistance. A craftsman living in the area of the school where the teacher taught was assigned to this teacher and school to help the teacher overcome his expressed weakness. Cooperation of this nature not only helps the industry but greatly improves instruction. The people benefiting the most are the students.

These techniques have made it much easier to talk with the industrial leaders concerning their role in the education of the city's boys and girls.

Asking for help. When a specific industry has been singled out to be contacted for help in an educational project, a number of the Superintendent's top staff plus a member of the discipline which would definitely be benefited, i.e., industrial arts, would work as a team in making arrangements for help and support from a particular industry. For example, when General Mills was approached to give financial aid and industrial advice to the Lincoln Learning Center, this team met with the top administrative staff of General Mills several times. By having a member of the school's top administrative staff present at the meetings, decisions could be made on the spot.

After decisions have been made by the top administrative staffs from industry and education, a task force composed of other industrial people and educators work together to determine how industry can help. In order for this task force to function properly, the industry people as well as the educators must be released from their present responsibilities.

Kinds of help. Industry can give a lot of things that won't cost them a great deal, such as technical assistance, suggestions as to projects, used machines, materials, a building with the necessary facilities and can be available to assist the teacher in teaching the course or actually provide a teacher to teach the course itself.

(Note: It is important that an industry know the limits – in other words, have it adopt a specific school rather than the whole school system or a particular curriculum area rather than a total curriculum area.)

Two programs adopted by industry. There are two programs in the Minneapolis Public Schools adopted by industry. General Mills adopted the Lincoln Learning Center, which is a store-front school on the north side of Minneapolis, and Honeywell has adopted the Bryant YES Center, which is located on the south side of Minneapolis. These experimental junior high schools are designed to motivate students least likely to succeed in a regular school setting and consequently the least likely to make it in the world of work. These programs are considered the first major partnership between the public schools and private industry in this area and the first business-supported learning centers in the country.

With special, flexible programs, tailor-made individual instruction and a class size of about five students per faculty member, the centers offer some of the most expensive education in the city, but they are regarded, both by the school system and by General Mills and Honeywell, as sound investments. The budget for each center is approximately $200,000 a year. Half comes from industry, the other half from Special Education, Title I ESEA and the Vocational Act. At both centers industrial production is used as a means to intrigue students to interest them in school and hopefully stimulate an interest in remaining there. Students discuss how industry functions, how our technologically-oriented society works and what careers are needed so it keeps on functioning. The basic skills such as reading, writing, mathematics, science, art and social studies are tied in with these industrial experiences.

A typical experience includes actual work experience. For example, General Mills, Inc., provided a commercial building and a production line for assembling and packaging of various toys. Students spend one-half of their day working on this line assembling and packaging actual products diverted from the production line of a toy manufacturer who is a subsidiary of General Mills, Inc. Typical pieces of equipment provided by General Mills include an L-bar, sealer, shrink tunnel, conveyors, benches, etc. In order for this production to function smoothly, the students have organized a packaging company known as the "LLC Packaging Company". This company was organized in the same way as any industrial company is in our community, with departments such as production, management, marketing, industrial relations, purchasing, research, finance, transportation, communication facilities, etc. Students soon learn that profit depends on efficiency of the production line. This is very vivid to them, since the amount of their training subsistence allowance depends on the profit made by the company.

Students have shown a great deal of enthusiasm for this type of support from industry. At the Lincoln Learning Center this enthusiasm came out in the form of student-written slogans, such as "Betty Crocker Loves Me", "General Mills is Mellow", and "Sock it to Me, Big G".

A group of students from the western part of the state recently spent two days visiting inner-city schools in Minneapolis. Included in the visit was the Lincoln Learning Center. Practically every prospective teacher in the group stated that the highlight of the two-day visit was the Lincoln Learning Center. The following is a typical statement expressed by these students:

> I feel the most interesting part of Friday's visit was the tour of the Lincoln Learning Center and the discussion with its director. It became a great interest to me because prior to Friday, I didn't know such a thing existed, and the inches of apparent success gained by the pupils are in my mind extremely valuable. Working with these students who ordinarily would be thrown out into the streets gives me a feeling of satisfaction that something is being done and these students are taking pride in their work. It's very incredible and fantastic in my mind.
>
> Definitely my thinking has changed since our trip to Minneapolis. A person as naive as myself about the lower socio-economic areas of Minneapolis couldn't see the schools and talk to the people we did without having some change of thought. I now realize, through this direct experience, that the schools have a severe physical and cultural problem in educating the inner-city people. By being aware through actually seeing the problem in North Minneapolis, I can begin to imagine the problem in Chicago, New York, Los Angeles, Washington, DC, etc.

Just being aware of the problem makes me feel I am partially responsible for correcting it. This doesn't mean I want to be a martyr to the cause but perhaps I could add something constructive as a student teacher, or possibly full-time teacher in this area. The very least I shall do, as a taxpaying citizen, is to contribute to the expansion of personnel and buildings in and for the inner-city people.

Has the cooperation of these industries been helpful in establishing meaningful experiences for potential dropout students? A statement made by Tom Kitto, director of the Bryant YES Center, indicates how effective the support of industry is in establishing a program of this nature:

> The assistance which Honeywell has given our project has been invaluable. Without their resources, this program would have been a minimal operation, if, indeed, it would have been operated at all. Although most of the money for this program comes from Federal and state funds, it often has seemed as if Honeywell was sponsoring the entire experiment. Their resources have made it possible for us to give our ideas an adequate test; whereas without their money and assistance we would have been plagued by shortages which would have seriously affected the quality of our experiment. In addition to their direct aid in case and equipment, Honeywell has made available to us consultants and services.
>
> One of the most successful features of our program has been our lunches, which Honeywell provides. The lunch is generally outstanding, superior in quality, attractive and adequate in quantity, so that no child need be hungry while he is in school.
>
> We are deeply indebted to Honeywell for this significant contribution, and on many occasions the children have indicated that the lunch is as good a meal as they have ever eaten.

According to Mr. Nathaniel Ober, Associate Superintendent, "The main objective of these centers is to keep the student in school and keep the doors open for him so he has a chance. If he drops out of school, all doors to our society close to him. All that is left is relief or the underworld. We want to build his self-image as a person who can and will succeed."

Through the efforts of industry such as General Mills and Honeywell, this very important objective as stated by Mr. Ober is being fulfilled.

Mr. Peterson is with the Minneapolis (Minnesota) Public Schools.

student clubs

Using the student club to strengthen the industrial arts program

W. A. Mayfield

Farmers, ranchers and manufacturers have known for centuries that to up-grade a product there must be continuous concern for each integrant that is needed to produce the product desired.

In education we have exercised concern for part of the elements needed by our product. We have majored in content and hardware and minored in the individual.

Research indicates that the teaching profession, in most cases, is replenished by the influence a teacher has upon a student. It seems that this special breed of dedicated teachers is vanishing as we continue to emphasize materialism and de-emphasize the individual. The willingness of a teacher to give of his time, over and above that required by the formal classroom, has contributed a great deal toward providing that needed element for a finished product in education.

We have developed student club activities around activities that strengthen the student-teacher relationship. To substantiate this, our research, involving 1,031 principals, supervisors, teachers and students, indicates that 91% agreed that student club activities did strengthen student-teacher relationship.

We felt through a closer relationship between student and teacher outside the classroom, the teacher would become more interested in the student's progress. We found that of the principals, supervisors, teachers and students involved, 73% agreed, 22% were undecided and 5% disagreed.

We hoped that through these activities the student and teacher participating together would improve attitudes toward cooperation, responsibilities and initiative. Our research indicates that of the principals, supervisors, teachers and students involved, 77% agreed, 19% were undecided and 4% disagreed.

Club activities are designed to improve student's understanding of technology. In the same research, we found 77% agreed that it did, 20% were undecided and 3% disagreed.

It was interesting to note that 100% of the principals and 96% of the supervisors involved said they would recommend that teachers use student club activities for up-grading the industrial arrs program. Eighty-nine percent of the teachers agreed on this.

We realize it is impossible for teachers to include all educational activities needed in the regular classroom; therefore, we felt the club was needed to round out the educational program. This same feeling was shared by 90% of the principals, 85% of the supervisors, 76% of the teachers and 88% of the students.

Objectives of student club work included activities that would help improve the students' school and community pride and services. We were pleased to find that 87% of the principals, 93% of the supervisors and 89% of the teachers felt club activities did improve the students' attitude toward community services.

We have emphasized democracy and democratic principles in education, but have found an educational void in this area many times. It was encouraging to note that 87% of the principals, 89% of the supervisors and 95% of the teachers felt club activities contributed to this educational goal.

We are always concerned about developing leadership in our students. Our research found that 95% of the principals, 96% of the supervisors, 100% of the teachers and 85% of the students thought club activities did this very well.

Of the various groups participating, 83% indicated there was a need for more student club participation.

Another interesting thing in support of clubs is that it is second only to grades in identifying dropouts.

With this kind of data to support student club activities, we are forced to raise one question. Why do we have so few club sponsors in industrial arts? In essence, we have said through our actions that we don't have time for students.

Our students are our best public relations avenue. Through our students, we must justify our laboratory needs, our instructional materials and our educational goals. Unless we run a student-oriented program, we can't justify our place in the total educational program. Student club activities can serve to bring you and me down out of that ivory tower –

down to where the student is, where the action is, where learning must take place. As a professional organization in the field of education, our basic concern for education should relate directly to the student.

Mr. Mayfield works in the Texas Education Agency, Austin.

IACC—moving!

David A. Hardy

I suspect that the majority of those attending the convention know little about our organization; therefore, I would like to give you some background of IACC, as well as some of the activities we have carried out this year.

IACC comprises approximately one-fourth of the AIAA. We do not, as of yet, have our own dues structure; each member pays $2.00 per year in dues to the AIAA, and in return he receives a year's subscription to The Journal. Our main purpose is to promote leadership, fellowship and scholarship through industrial arts, and to establish continuity between the industrial arts organizations from the local level to the national level.

Our Executive Board met in September at Raleigh, NC, to plan the year's activities. Our two major projects this year were the IACC Handbook and the IACC Directory. The Handbook is available to schools who wish to start a club and to schools who already have a college club but who are not members of IACC. The Handbook lists the necessary information for starting a college club and the creed of IACC. The Directory is an employment service to college seniors and juniors; it lists the names, addresses and specializations of college seniors across the nation who are affiliated with IACC. The Directory is available to industrial firms as well as to school administrators and supervisors.

There is much potential value in involving students professionally in the affairs of a well-established educational organization such as the AIAA. Although we have not, as of yet, been formally accepted by the AIAA, we are, nevertheless, designated as a division of that organization.

Such a professional organization could better understand the needs and problems of college students if perhaps the students could be represented in the business affairs of that organization. These student representatives could contribute to the AIAA on such matters as curriculum development, teaching methods and teaching principles. Such student representation could also help close the large gap between the local and national organizations, resulting in a solid continuity from the local club to the national association. We students, who are the future industrial arts teachers of America, could benefit from the close relationship with the AIAA, and, in turn, that organization could benefit from our concepts and creativeness. Such rapport between the AIAA and IACC would undoubtedly contribute to the professional growth of the future industrial arts teachers of this nation.

And with IACC comprising one-fourth of the AIAA, it is easy to see what an impact the students could have on the total organization – what an impact they should have on the organization. Why, then, should they not be given equal representation? We feel that we could contribute greatly to the already outstanding professional nature of the AIAA.

Mr. Hardy is president of the Industrial Arts College Clubs.

The industrial arts club sponsor's purpose

Bobby Ray Tillman

Teacher participation in industrial arts activities is an extremely important step in achieving almost any profitable goal. An instructor must show an interest, not only in his work, but also in his students; this interest must not end with regular classes but must continue through all phases of club work and other after-school activities. On the high school level, the industrial arts club sponsor has the possibility – and should take the responsibility – to lead his students properly into a well-rounded and profitable life. This condition exists mainly because the industrial arts instructor is in a position of importance to his students: It is with him they discuss their projects, and it is to him they look for assistance. By properly directing these discussions and by sincerely showing an interest in his students' work, an instructor can easily gain the admiration and respect of almost any one of them.

It is the lack of admiration and respect for America's adults, I believe, that has caused so many young people to seek on their own some other quality with which to govern their lives. As can be seen by the world-wide unrest of young people, these attempts are often in vain. It is not, however, the fault of our own young Americans that these two qualities are non-existent in their elderly leaders.

I do not believe that industrial arts teachers will change the course of the world; I do believe that a great many young people who can be properly guided by them may, in turn, help others and thus start a chain reaction of almost unlimited magnitude. Such events are far from being impossible: Hitler aroused the interest of a small group of dedicated individuals, then set out on the world-shaking terror of his Third Reich; communism, which began from a twisted theory and a few dedicated believers, has grown into a force of hundreds of millions and is threatening the lives of every human in the world today.

The rebirth of American patriotism is only as far away as is someone with enough humble pride to start and support such actions. Conventions like this one should be composed entirely of the latter kind of people. This can be proven by examining the American Industrial Arts Student Association's Creed:

> I believe that industrial arts holds an important place in my life in the technological world. I know there is a necessity for the development of good attitudes concerning work, tools, experimentation, and processes of industry.

Notice this third paragraph:

> Guided by my teachers, craftsmen from industry, and my own initiative, I will strive to do my best in making my school, community, state, and nation a better place in which to live.

If this one vow were carried out only to its face value, the nation-wide effect could be seen in only a matter of months. Continuing:

> I will accept the responsibilities that are mine.
> I will seek on my own a safer and more effective method of working and living.
> I will strive to develop a cooperative attitude and will exercise tact and respect for my fellow man.

It is interesting to note how well this last vow has been followed.

> Through the work of my hands and mind, I will express my ideas to the best of my abilities.
> I will make it my goal to do better each day the task before me and to be steadfast in my belief in God, my country, and my fellowman.

This last vow is in need of special attention, since in it lies the seed necessary to propagate a whole new feeling of religious, nationalistic and individualistic pride. If it were sincerely planted, America's youth would soon have a whole generation of leaders to whom they could look with both admiration and respect.

This whole revolution could be initiated by those assembled at this convention. Individuals, schools and companies from all over America are represented here; if a sincere and lasting dedication to the goals set by our creed could be taken home with each one of you present, a prosperous future for our country would soon be realized.

I am not making this speech to fill a time lapse in our program; neither am I trying to present some wild, irrational ideas similar to those that many teenage children – note the word children – might present. These ideas are completely rational and can be effectively enacted if those who vowed to do so will take an active part in their fulfillment.

I am not away from the basic thought of my topic, either. High school and junior high school students are very susceptible to the influences of their environment. Since a large portion of this environment exists under the influences of instructors, it is very important that the adults set good examples for their students. All teachers hold this position of importance, but, as has already been shown, the industrial arts club sponsor can use his influence in a more profitable manner if he so chooses. Very infrequently is this done.

Let us examine the last paragraph of the creed once again for a possible method to reach the goals thus far expressed:

> I will make it my goal to do better each day the task before me and to be steadfast in my belief in God, my country, and my fellow man.

"...to be steadfast in my belief in God, my country, and my fellow man." This is the answer! In a day when the existence of God and the validity of His word have been challenged beyond reason, this belief is very unpopular. It is, however, the only workable and lasting solution to our problems.

As at the Minneapolis convention last year, I would like to close with the same admonition. The Bible says in Proverbs 29:18, "Where there is no vision, the people perish...." We are the leaders of industrial arts; many of you are the teachers and sponsors of students all over America. If we have no vision, what can we expect of the future?

I will be leaving high school in only a few weeks. I would like to know that those who may follow me will have a brighter path to travel and a new generation of leaders which they can follow with sincere attitudes of admiration and respect.

Mr. Tillman is a senior at Crane (Texas) High School.

supervision

Supervising the action in the elementary school

Ralph V. Steeb

Industrial arts educators have long recognized the value of activities involving doing, making and manipulating, and using things in the educational program of elementary schools. For more than three decades sporadic attempts to include industrial arts in the elementary curriculum have been initiated, only to quickly fade away in most cases. During the past five years a national reawakening to these values as they are achieved through industrial arts methods and materials has been evident.

Industrial arts personnel have been saying that construction activities in the elementary grades can reinforce academic units, enrich learning situations, motivate pupils to learn, increase the desired outcomes, provide a basis for understanding and appreciating our cultural heritage and the world of work, and aid in development of manual dexterity. New emphasis on behavioral objectives, especially the psycho-motor, strengthens the impetus to add industrial arts to the elementary curriculum. Factors contributing to this impetus are:

(1) the increasing variety and quality of the elementary literature,
(2) major, funded research projects and teacher institutes,
(3) the emphasis on an industrial arts sequence which includes K-12, vs. 7-12,
(4) the concern of vocational education and the vocational amendments for exploratory programs and occupational orientation in the elementary school, and
(5) an increased awareness by elementary educators to individualized instruction and the recognition that all children do not learn from the same stimulus or method and that activities enrich and motivate learning.

Problems of Supervisors

(1) Oversold Philosophy
   (a) A major problem for supervisors is that the elementary school industrial arts program has been oversold before the practical considerations were established. Elementary administrators are requesting assistance and information at a time when available materials and on-going programs are limited.
   (b) State Accreditation Standards give strong impetus to creating industrial arts elementary programs, again without sufficient orientation.
   (c) State departments of education have stimulated the development of elementary programs through the distribution of educational specifications and elementary bulletins.
   (d) Bond issues have included industrial arts and provided the money before programs have been developed.

(2) Financial Problems
   (a) Providing laboratories and equipment is viewed as an expensive program for elementary schools which have not had industrial arts before.
   (b) Consideration of mobile carts versus permanent laboratories often results in the choice of carts, which are inexpensive but which, based on experience, are not the best arrangement.
   (c) Consumable materials should be furnished without fees to the pupils. This often is a financial problem.

(3) Purposes of the Program Not Always Understood
   (a) Some elementary educators see industrial arts activities as only making things, such as a crafts program. Others, including some industrial arts personnel, believe that all activities should be correlated to the elementary academic subjects. A third group believes that a blend of correlated projects for personal and recreational purposes is best. A fourth group would limit industrial arts activities to a study of industry in the culture as another subject for the elementary school.

(4) Teacher Preparation
   (a) A major problem to initiating industrial arts in elementary schools is the lack of personnel to teach and supervise the programs. Elementary teachers in most states have no industrial arts training and are unaccustomed to using tools and materials. At the same time industrial arts teachers have

not had courses in elementary education and fail to understand the nature of the elementary child.

(5) Operational Limitations

(a) There is a lack of teaching guides or outlines for use by the elementary teacher. Many individual articles have been written, but until recently there have been only scattered sources. Several items are now appearing, such as Dr. Scobey's book, Teaching Children About Technology; Dr. Gilbert's Children Study American Industry; Hoots', Analysis of Elementary Instructional Units; and Ohio State University, Guides to Industrial Arts for the Elementary School.

(b) Reluctance is shown by elementary teachers and principals to begin a program for which they have little training or knowledge. Most elementary teachers are skeptical of attempting manipulative activities associated with tools. Industrial arts programs seem to be ambitious and at times chaotic, as they may well be, without adequate consultive assistance, teacher planning, teacher training. These feelings of reluctance have caused delay in program development. It is not because teachers are not interested in activities. It is merely that they lack the techniques, information, materials and equipment for the program.

(c) The availability of an industrial arts supervisor has usually meant success for an elementary program. The lack of special supervision results in the decline of the program as time passes.

(d) The lack of understanding of the nature of elementary children and elementary education by industrial arts personnel also hinders a program. The transition to elementary school by secondary industrial arts teachers is extremely difficult, if not impossible for some persons.

(e) Classroom difficulties – enough time should be devoted to instruction. Fairly large blocks of time are helpful. The construction should not be undertaken for the purpose of making a "showing" for the administration or parents. Adequate space for the activities is necessary with adequate supplies and equipment.

(6) Instructional Program

(a) A unified approach with home arts, crafts and industrial arts is sometimes used. In actual practice the cooking facet is the most difficult.

(b) Primary grades tend to make more personal projects which do not always relate to academic work. Immediate activities should relate other school subjects and activities.

(7) Laboratory Considerations

(a) Bench height for intermediate pupils can be standard; for primary it can be shortened.

(b) Which machines should be placed in the laboratory--drill press, band saw, scroll saw. Power machines are generally not used by pupils; portables are infrequently used. Skill is not the primary outcome.

(c) The open-lab concept, as proposed in certain modern schools, is too noisy.

(d) The choice of hand tools can be a problem. Commercial tool carts and tool panels are often supplied with too many tools. Most frequently-used tools include hammers, coping saws, C-clamps.

(8) An Effective Teacher

There is no substitute for the judgment of the teacher. Therefore, teachers must be carefully selected, as all cannot function effectively at this level. Teachers must have a passion for the work and compassion for the pupils.

Suggested Solutions

(1) In-service training for teachers either through the local school district or through university extension classes.

(2) The preparation of state guides to assist local districts in planning programs and facilities.

(3) Requiring undergraduate elementary school teachers to take a course in industrial arts.

(4) Possible certification changes or standards for industrial arts teachers and supervisors in elementary schools.

(5) A more active role by the elementary industrial arts council to make available sources of information and bibliographies and serve as a central source of information.

The value of the outcomes to individual students far exceeds the concern for problems. Efforts should be made to sustain the momentum now experienced and to develop industrial arts programs which provide more effective learning for elementary pupils.

Objectives, as a result of industrial arts experiences in the elementary school:

(a) The pupils participate in planned activities and experiences including the construction of projects related to and reinforcing the elementary school subject matter content and related to recreational and personal purposes.
(b) Pupils demonstrate the correct and skillful use of basic hand tools to manipulate three-dimensional materials.
(c) Pupils can identify materials commonly found in the home and school.
(d) Pupils demonstrate good work habits, including pre-planning and organizing the activity, caring for equipment and materials, respecting and cooperating with associates, cleaning up, and completing a task once it is started.
(e) Pupils can identify and differentiate a wide variety of occupations.
(f) Pupils have developed recreational interests and hobbies for the better use of leisure time.
(g) Students exhibit safe practices with tools and can relate safety to broad areas of living.
(h) The pupils demonstrate muscular coordination and the release of emotional tensions through active participation with tactile materials.
(i) Pupils solve problems by constructing group and individual projects.
(j) Construction and manipulative activities develop a need for the pupil to seek further information through reading resource materials.

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crafts

Crafts for the secondary schools

T. Gardner Boyd

There has been considerable controversy among industrial arts educators concerning the crafts area and the part this course should play in a modern industrial arts program.

When we examine the objectives of the industrial arts, we have a tendency, and rightly so, to think of our curriculum offerings as being only those which provide a study of industry. Maybe we are selling ourselves a little short when we tend to mimimize or delete altogether some other very fine goals which might serve as a basis for reaching our main objectives.

Industrial crafts provides a means by which a larger view of the industrial-technical world may be visualized and understood by students. This course provides for a study of the broad scope of industry – not just the basic techniques required to construct a project. Crafts can also assist in attaining another predicted educational need. Many experts point out that cybernation will make it possible for industry in the future to produce most of the consumer goods needed by the population utilizing a very small percentage of the available work force. There will probably be a time in the future when there will be work for the select few and leisure for the masses. In fact, society has a shorter work week today than has ever been experienced in the past. This creates a need to educate much of our population toward a life of worthwhile, meaningful leisure.

As we observe the attitudes, actions and other characteristics of students, and the changes taking place in our schools, it appears to me that we should not get so involved in change that we lose sight of the many things we could accomplish if we thought more in terms of a continuing industrial arts curriculum and how each course offering contributes to our objectives. This curriculum could branch out at various levels and provide a program which would include technological orientation, exploration, avocations, basic skills development, problem-solving situations and creativity experiences.

At this point let us explore what is involved in curriculum planning and building. A curriculum should be an embodiment of preferred values. Any fundamental change in curriculum must, therefore, start with an examination of the values which underlie the curriculum. A curriculum plan is valid and defensible only when it represents an integration of:

(1) A point-of-view or series of assumptions which underlie the whole school effort.
(2) Specific objectives defined in terms of desired behavioral changes.
(3) Learning experiences which will yield or produce the behavior desired.
(4) Evaluation procedures which will assist in determining how well the objectives are being achieved.

In curriculum planning, content and method are inseparable. An industrial arts curriculum is as much method as it is content. Content and method are, in fact, inseparable, because the way one teaches determines to a large extent what he teaches and what he teaches determines the way he teaches.

Progress in curriculum development requires the advancement of all the areas of professional activity. While the teacher or supervisor or teacher educator may be tempted to go his own way, he soon must face the reality that the profession as a whole determines what he can do. It is wishful thinking for any member of our professional family to expect to get ahead of the field. We must work in larger groups when matters of policy are to be determined, and these groups must be representative of the total profession. If the above is true, we as industrial arts educators need to give some pretty serious thought to a more organized and unified approach to our curriculum development.

Industrial arts educators have taken off in many directions exploring, researching and developing curriculum projects – and this is good. However, as we search for improvement we must not overlook such goals as incentive, creativity, inspiration and developing a desire for learning. We should point out here that developing a desire for learning is a serious problem among the inner-core schools of our large urban centers. A census of this population would reveal that we have a fairly large percent of our secondary school enrollment in this category.

What part should crafts play in this total industrial arts curriculum? Tracing the history of crafts in industrial arts education, we find that for many years courses in arts and crafts or, if you prefer, handicrafts, have been offered, in which handwork in leather, plastics, art metal, wood carving, lapidary and many other areas has been taught primarily as a recreational, avocational activity.

The total area of crafts is perhaps the most varied and least organized of any industrial arts instructional area. The industrial arts profession needs to make a study of the crafts area and organize it into a more unified area in our curriculum. It is time we took a stand on the following topics and made suggestions concerning them:

(1) The major purpose or goals to be attained in a crafts program.
(2) At what levels should crafts be taught.
(3) Course title.
(4) Course content to be taught at each level.
(5) Teacher preparation.
(6) Facilities needed (determined by above topics).

Current pressures being placed upon the schools at all levels to accelerate the learning processes, update teaching procedures, remove courses that cannot be justified – these certainly make it imperative that we be prepared to prove that each of the courses we have in the industrial arts curriculum assists in meeting the educational objectives of the total school curriculum.

Keeping in mind what has been said to this point, let's explore some ideas which could be used in developing a more uniform, defensible crafts program at the junior high level. Most educators would agree that the crafts program at this level should be a part of the industrial arts exploratory curriculum. The program could provide experiences with several materials that have both industrial application and leisure time pursuits. The purpose here should be to bridge the gap between craftwork and the well-designed, mass-manufactured products used in daily living. The desire for objects that are unusual, useful and beautiful makes craftwork important in daily living. The basic difference between a craft project and a mass-produced product is the way the material is worked. Industrial methods can be used to mass-produce the wall plaques, trays, etc. Through mass-manufacturing methods, industry is capable of producing many identical products. The crafts course at this level should provide for a study and examination of the various aspects of hand work and industrial methods used to perform the different operations.

The course content of the program at the junior high level could include many areas of work, but a study of existing programs seems to point out the following as being basic: plastics, ceramics, jewelry and art metal, leather, wood carving and textiles. These areas contain content for the study of industry and are popular leisure-time activities in our country.

A junior high crafts program should be organized to teach an awareness and appreciation of good design, quality craftsmanship, safe work habits, orderly procedure, and an understanding of common tools, machines and devices. Opportunities should also be provided to study the industrial uses of the materials and how these materials can be combined in the design and construction of a product.

The instructor at this level should be an industrial arts major. He should have a good background in design and design application. He must be a good organizer and have the ability to teach in a multi-activity-type program.

The senior high program should be housed in a separate facility. The major goal here should be the study of industrial technology as it relates to plastics, leather, ceramics, etc. Emphasis ought to be placed on a study of the industrial organization and methods used in processing the materials to produce a product. A study of the plastic industries, for example, would include experiences with equipment used in injection molding, blow molding, transfer molding and other processes. In ceramics, a study of these materials and their industrial use in aerospace crafts, the machine tool industry, components in electricity-electronics, and other industrial applications, would be emphasized. Many phases of industrial design could be taught as a planned part of the course at this level. Opportunities for problem-solving and creativity should certainly be heavily incorporated in this course.

The laboratory at this level should be equipped with a wide variety of small production machines and testing equipment on which most of the industrial processes can be performed. The resource center in the laboratory should have tapes, films and other materials which provide in-depth study of the industrial areas being taught.

The offering of a crafts course at the junior and senior high levels is needed to assist us in fulfilling our industrial arts objectives and the school's educational goals. The urgent need to get the crafts program in the secondary schools organized cannot be over-emphasized. In this presentation no cookbook approach has been outlined because, as pointed out earlier, the development of any curriculum and the courses to be included should be an organized and unified team effort. The ideas presented here could be used as a nucleus for the development of a crafts program at the junior and senior high levels.

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Crafts in the elementary school

William L. Deck

The interesting things done in the elementary school with tools and materials and the eagerness children demonstrate in working with tools and materials create the feeling that this is an easy topic to discuss, but when the terms used to identify this work are explained as to why one term is used instead of another, the problem becomes more difficult.

An examination of the literature regarding the application of tools and materials in the elementary grades reveals a host of terms used to identify the activities involving tools, techniques and materials. As one examines the literature more closely, it identifies three schools of thought.

One holds that industrial arts is a body of subject matter which should be taught in the same manner as English, history, geography and mathematics. The objectives are similar to junior high. Information and experiences are scaled down to fit the children in the elementary school.

Another thinks of industrial arts as an activity method of teaching but has no informative content to be taught and no required manipulative experiences or projects. Tools and materials are used to solve problems growing out of regular school subjects. Industrial arts is thought of as a means or method by which the elementary teacher is better able to achieve her goal.

This concept has had many terms applied to identify the activities involving tools and materials. Some of these are arts and crafts, handicraft, integrated handwork, handwork, constructive activities, manipulative activities and related information.

Louis Newkirk, O. S. Harrison and Dean Schweickhard were some of those supporting this philosophy.

The third is a compromise which regards industrial arts as having content and method in the elementary school. Industrial arts activities are carried on in kindergarten through grade three as an integral part of learning. No special time is allotted, because the activities used at any time are for learning. Industrial and group projects begin in grade four and are integrated with class activities. Dioramas, models, tools, materials help vitalize and create intellectual interest and add realism to regular classroom work.

This concept has been identified as creative arts, practical arts and industrial arts. Industrial arts is most often used.

James Russell, Frederick Bonser and Lois Mossman were advocates of this philosophy.

The Industrial Arts Department at Southwest Texas State College has offered a program of industrial arts for elementary teachers for thirty years, and approximately 200 teachers enrolled last year. The department has the philosophy that industrial arts has content and method which will help the elementary teacher achieve her goal. Each student develops a unit or re-works a unit she has taught. The unit must include tools and materials and their application in achieving the objectives of the unit.

The writer has been engaged in an experiment in the third grade of one of the local elementary schools. We used units in the school's curriculum, which helps children become acquainted with the industry of the community as well as with what their parents do to make a living.

This is the first time industrial arts has ever been tried in the elementary school in San Marcos, Texas.

We use the content and method approach. We work one day a week for one-and-a-half hours. The children work about one hour, and their interest is high when work stops.

The school does not have tools or other facilities. There is only one table, four by six feet. The writer furnishes the tools used in the experiment.

The first meeting we talked about trees, wood and lumber. Several types of lumber were demonstrated. The crosscut, back and coping saws were also introduced and demonstrated. The pupils were given an opportunity to use the backsaw to cut white pine with the aid of a bench hook.

The second meeting, the block, smoothing and jack planes were introduced and demonstrated. Then the children were given time to work with block and smoothing planes on white pine. They tried walnut and ash.

The third meeting, we demonstrated how a screw holds and gave the general rule in fastening with screws. Then with holes made, the children were given time to experiment with the screwdrivers and screws. These third-graders used the screwdriver and screws very well.

The fourth meeting, nails and hammers were demonstrated. The seven-, nine- and thirteen-ounce hammers were displayed. The children were given an opportunity to drive nails into white pine. They used 2D, 3D nails and some wire brads. Driving the nails was the most difficult activity. They used the screwdriver much better.

Questions were asked. How many and what kind of tools did they have at home? How many had used these tools at home? How many had helped their parents build things?

The children were asked if they would like to build a project made of wood. Due to limited tools and other facilities, all built the same project. We introduced mass production, what it meant and how it was accomplished. Here the "jig" was introduced and defined. Simple jigs were demonstrated. The classroom teacher had one pupil use a penny and a pencil to demonstrate a simple jig. This was related to the great variety of products in our community.

The project was a telephone pad. It consisted of a base of white pine one-half-inch thick, two and seven-eighths inches wide, by six inches long. A spool to hold the pencil was cut at a seventy-degree angle. A paper pad two by two-and-a-half inches, consisting of a dozen sheets, was glued together to a cardboard back with Elmer's glue and gauze.

Two jigs were made to cut the base exactly six inches long, and two boys built one of them. A jig was made to hold the spool so it could be cut at the proper angle. Two gluing jigs were made to position the spool on the base, and two pupils built one of them. Each child used each jig in cutting the base, spool and gluing the spool to the base. Each child was shown how to use sandpaper and sand the base and spool. They worked together, helping each other with jigs, gluing the paper pads and painting the base and spool. Felt pads were cut and fastened to the base to protect the furniture.

Other activities which will relate to units in the curriculum are copper and aluminum tooling, copper enameling and leather. Field trips are planned. Films such as "American the Maker" will be shown.

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Crafts for leisure

Chris H. Groneman

Education is not given for the purpose of earning a living. Education is learning what to do with the living after you have earned it. This philosophical attitude is made doubly pertinent to our lives when we realize that in 1968 you and I, and our neighbors and friends, spent over one billion dollars for hobbies. Crafts result in hobbies. Roger Bacon wrote that the function of knowledge is not in the exhibition of either accomplishments or prowess, but is to serve man. Crafts and hobbies serve man by releasing him from the tedium of his daily schedule and leading him into exploration and personal expression.

Mr. Kallen in his book The Education of Free Men said that "fine" arts have been exalted over "industrial" or "commercial" arts, and culture is preferred over vocation. The concept of vocation, generally, is that studies are undertaken to remedy a defect, learn a trade, or improve a skill. Culture, on the other hand, is communication of knowledge; judging of fine arts, letters, philosophical systems; and appraisal of skills.

The wall that keeps vocation and culture apart is the idea that productive labor is menial, while leisure is the providential endowment of men of noble and free birth. This, unfortunately, keeps education always either cultural or vocational.

New attitudes suggest that culture is a progression in harmonious self-development; that adult education is "human preference illuminated and clarified." From a scrutiny of hobby interests, it appears that human nature "prefers" avocational activities that range through money-making schemes to indoor hobbies, collecting and nature hobbies, and skilled ones.

Schools are the barometers of the prevailing climate of opinion, community by community. The pressures on American education are economic, ecclesiastical, political and cultural. Liberal education starts from the people as they are, where they are, with all the diversities of vocation and culture, faith, custom, tradition, knowledge, skill and power. Hobbies are affected by two of these: economic and cultural.

The universal right to education is specified in the 26th Article of the United Nations' Universal Declaration of Human Rights. The UNESCO idea of adult education is the brotherhood of human destiny. It is all-encompassing in scope, as one can readily see. The broad concept is that adult education and avocations are a question not so much of teaching the adult such and such an art or science, as of instructing him in a much more vast subject which we foolishly imagine he has already mastered – that of life itself.

Newsweek Magazine contained an informative article on this interesting question, written by Dr. Paul Essert, Professor of Education at the Teachers College, Columbia University. Dr. Essert found out that thirty to fifty out of every one hundred adults in the United States are either studying, or planning to study professionally or avocationally, after working hours. Thirty millions of the population are taking some part in this movement. Essert states that in the foreseeable future, adults may outnumber their offspring in educational courses. He found that the adults in America today feel that they cannot become generally informed or occupationally or avocationally skilled in the score of youthful years.

Is there too much stress on vocation, and not enough on avocation? A cynic is one who knows the price of everything, and the value of nothing. Should we perhaps evaluate our educational program and ask not what it costs, but what its value is?

Industrial education comes cheap. Working with one's hands, as well as one's mind, is admirable. When the two are unified in a hobby, the ultimate value is realized. Whether we follow the philosophy of Rabelais, who stated, "The aim of education is the forming of a complete man, skilled in art and industry," or that of Martin Luther: "The object of education is preparation for more effective service in state and church,", or the one propounded by Palmer, who said, "Teaching may be defined as the awakening of another's mind, then training its faculties to a normal self-activity," or that of Montaigne: "Education is the art of forming men, not specialists" – we see that we actually do recognize that the original Latin word, "educo" (meaning 'to draw out'), is our subconscious conception of what education is and can be, so we can agree with yet another definition, set forth by Bryson, "Education is self improvement."

The topic of adult education and avocation might be considered from the standpoint of a circle, starting with the individual, revolving through several modern concepts of adult education (as proposed by the NEA and leading educators), then widening the field to world-wide significance, and in closing the circle, narrowing down again to the individual. We can also start with hobbies: Those things you can't wait to get to doin'! Find out where hobbies stop and vocation begins, and again end up with the individual and his interests.

Especially significant is the fact that most adults either have – or want – hobbies. This indicates that there must be a great lack in the everyday makeup of their lives. UNESCO wants to fit the individual for life, and if a hobby makes him better-adjusted and happy, then it seems that this is an area in adult education which can be stressed much more in the future than it has been in the past.

Hobbies can begin with leisure-time interests. They then often develop into a vocation whereby the adult has found his place in society and is making his living in an interesting manner, and not working at something just because a paycheck is involved.

I think that adult education needs hobbies as a very definite and important phase of the curriculum. Naturally, we are entitled to our various points of view.

I will cite only one specific example of the potentials of a hobby. A former student of mine graduated in technical and industrial education, went to work for Shell Oil Company as an oil scout; became interested in collecting antique clocks and repairing them in his days off; and is now a leading antique dealer and interior decorator who couldn't care less about scouting for oil (which he gave up years ago).

Every person wants to be important, and gaining recognition through an unusual activity – a hobby – is a highly satisfactory way to assume one's place in the community. The community is the world, and the world is a community, and we, as individuals, are the basic units of the entire picture.

Adults need hobbies. People gain fame frequently through recognition of an unusual activity or hobby rather than because of some worthy but unglamorous everyday profession. Hobbies are the "thing" in life. As they say in this modern parlance – we all have to have our own "bag".

I can mention many virtues of hobbies. Included in the list would be that they are the yeast that leavens our tedium, and, as such, cannot be overstressed; they are a medium of self-expression which marks man above the unimaginative bipeds; they add spice to life and make man happier and better satisfied with his lot, which in turn makes him a better citizen.

Hobbies promote harmonious association with others having mutual interests. There are no strangers among those doing the same thing or interested in the same cause. This is true whether one meets them in a local gathering or in some remote island in the Pacific.

Many famous world personalities have well-known and rewarding hobbies: Kettering had his model airplanes and railroads; Deems Taylor, woodworking; Queen Mary did magnificent needlepoint; Churchill painted with the talent of an artist, as did General Eisenhower. These people acknowledged something lacking in their famous careers, and sought inner peace and expression through very personal outlets.

The talk about democracy has become clouded and confused. Democracy does not mean that all men have equal ability; it means only that all men should have equal opportunity. Adult education should not force all adults who seek additional education into identical fields of interests. It should only offer the opportunity for each to pursue his own interests.

Good fellowship has been sponsored for years between nations by exhibitions of arts and crafts, and these stem from the individual. A workman who understands and appreciates the interests of citizens of a different nation lays the foundation for larger contact and mutual trust between the nations themselves. This is a repetition of the realization that the individual is the nation, nations the world... and the world, a place of individuals, bound together by the exchange of ideas, activities and mutual interests.

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drafting

Student drafting stations

William H. Thomas

Vocational and technical education today finds that it is in the forefront of a new era. This new era is a time of redirecting our school systems to place the emphasis on career orientation. Our school systems will be redirecting their efforts to cope with today's problems of dropouts, underachievers and unemployed to bring the fullest possible benefit to our urban society of the '70's and beyond. At the same time increased complexities in the ever-accelerating technological changes make advanced technique orientation essential for the training of the upper-echelon, talented students, in order to meet the needs for advanced education in the future.

This challenge demands that vocational facilities in our public schools be flexible and, most important, capable of adapting to the rapidly-changing technological advancements that are taking place in industry.

Tomorrow's sophisticated hardware in this new era must be designed by career draftsmen. The drafting student of today is being required to be trained increasingly on the kind of equipment he will use when he steps into industry for a career. Gone from the industrial scene are the wooden stools, high boards, T-squares and triangles of the past. They are being replaced by modern equipment necessary for industry's techniques.

These drafting techniques cannot be effectively taught on the equipment currently being used in most educational facilities. The accounting department has forgotten the green eye shade, and the typing classes have gone electric, and yet, technical drafting departments have had to make do with facilities that are antiquated by today's and certainly tomorrow's industrial standards.

If you agree that tomorrow's draftsmen should be trained today on industry-oriented equipment, then consider how this equipment has changed and will be changing in the future. Student drafting facilities today vary from a low of the old "horses and boards" equipment – to a median of T-squares and drawing boards – to, at best, double-winged fixed-angle tables with parallel-arm machines.

With burgeoning class growth, today's facilities do not have proper utilization of space, temporary tables are moved into the classroom, and the result is more crowding and less student attentiveness and efficiency.

In the next ten years the demand for draftsmen is expected to double. Industry has a right to expect student draftsmen to be trained on the kind of equipment they will be using. Certainly fledgling stenographers, auto mechanics, welders and machine operators are receiving training on modern equipment – why not draftsmen? The young draftsman trained with drawing board and T-square will find it difficult to adapt to the modern track drafting techniques used today.

A number of companies, including Frederick Post, have led the way in providing modern student drafting stations – the kind used by industry – for use in training draftsmen of today and tomorrow. About one year ago, Post introduced a new series of classroom equipment called OJT – for "On the Job Training" – Student Drafting Stations. Although industry-oriented, this equipment is education-designed to be compact. It is built to withstand years of hard student use and priced within the budget of any school system. The modular construction of these rugged steel drafting stations permits flexibility of room arrangement for efficient utilization of classroom space.

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electricity/electronics

Electricity in the fourth grade—making a buzzer

Andrew C. Baggs

Wasatch Elementary School at Provo, Utah, is a normal K-6 school with an average attendance of 500 students enrolled in 16 classrooms. The average teacher load is 32 students. Industrial arts at Wasatch is taught as a separate subject to the fourth-, fifth-, and sixth-grade children. These children come to the Industrial Arts Laboratory at regularly-scheduled periods, during which a systematized program of industrial arts is presented in a general shop atmosphere.

A closely integrated program of industrial arts is carried out with the primary grade children. These boys and girls work mostly in their classrooms directly under their teacher. I am the consultant and assistant to that teacher.

I teach industrial arts because I am concerned about children. The Utah Educational Review, page 20, March, 1965, stated, "Let us set the child in our midst as our greatest wealth and our most challenging responsibility. Let us know that the race moves forward through its children. Education is the heart of society - and the child is the heart of the education system."

One of the objectives of industrial arts at Wasatch is to teach children how to cope with some of the tools and materials of industry. John Dewey stated that children should "learn by doing". Following this tenet, we try to give children manipulative experiences using some of the tools and materials of pertinent industries. One of these is electricity.

Electricity is so commonly used today that it is sometimes taken for granted just like air; it has always been available. It is as difficult for us to imagine life today without electricity as it is for the child to conceive of being without television. This year's first-graders have never lived in a time without space flights. They were all born after John Glenn's historic journey. Electricity is truly one of man's most valuable servants, providing, among other things, heat, light, communications, transportation and much of the power which makes it possible for modern industries to operate.

One of the very important uses for electricity in this modern world is that of communication or the sending and receiving of information. Civilized man has always had the desire and the need to communicate with distant points, to talk with someone, somewhere, where he isn't. One form of distant communication is accomplished by the buzzer or bell, which by its signal tells us that the cake is done; secretary, I want you; it's lunch time; we have a guest at the door; and many more.

Kindergarteners, first- and second-graders have experimented with permanent magnets and are familiar with magnetic attraction. Third-grade children are fascinated to learn that when a current is passed through a wire or conductor, a magnetic field is set up around that conductor. They learn that when the conductor is formed into a coil, and when an electric current is passed through the wire, the magnetic flux becomes greatly concentrated. This magnetic force can be made much more powerful than the pull or force of any permanent bar magnet.

Children are eager to show their knowledge and demonstrate what they have learned by making their own electromagnet. They wrap several turns of enameled magnet wire around a nail. They remove the enamel insulation from the terminal ends of the wire, and then they test their magnet by connecting it to a battery and counting the number of pins or tacks it can pick up at one time. This gives meaning to the instruction to wind the coil carefully and neatly; to make the connections properly. When the magnet does not work, they check for a broken circuit. They learn that a complete circuit is necessary to have current flow. They also learn that magnets can be made stronger by increasing the number of coils on the core, or by increasing the amount of current, the number of batteries in the circuit.

Fourth-grade children wind the electromagnet again to give practical application to several electrical principles: electromagnetism, controlling electricity and communication. This is done as a closely-correlated activity with the classroom teacher. Construction of a buzzer is a highly-motivating project. It is simple, one the child feels he can make rapidly, and one the classroom teacher can comprehend. It requires about two hours of shop work that can be accomplished during three 45-minute periods. This break-down of work time enables the teacher to schedule the activity so it fits in with her science or social studies program. The academic material and the project stay current with each other.

At Wasatch, children start their investigation of electricity in the classroom using their science texts as well as additional reference materials from the Instructional Media Center. The students learn about the production of electricity, the transportation of it, and the need for current controls. They have an educational excursion to the local power station where all this is shown to them. To give a practical application of one of the ways electricity can be used in communication, the buzzer is developed, incorporating the principle of which the child has gained academic knowledge.

The buzzer is started with the child winding a coil. The coil is made using an 8-penny common nail for a core, insulating it with 1-1/2 inches of 3/4-inch masking tape and winding approximately 20 feet of size 26 enameled magnet wire around the nail.

The student begins by measuring and cutting the proper length of tape. He then obtains a nail and wraps the tape around the nail, with the long, 1-1/2 inch side as the axis of wrapping.

Each child makes a paper squibb from a piece of scratch paper and winds his 20 feet of magnet wire on the squibb. This keeps the wire from tangling while the child winds the coil. With thirty or more children winding coils, lengths of wire are all over the room.

The magnet is completed when all the wire except the two tails, each about eight inches long, has been wrapped around the nail. The tails are twisted together loosely at the base of the coil to keep the coil from unwinding.

The child next obtains three blocks – the base, the coil block and the stop block. The student uses the drill press to drill the necessary holes, then sands the blocks smooth. The coil is placed in the coil block and this is glued to the base. The stop block is glued opposite the coil block.

The vibrator and key are made from a piece of tin can metal. They are measured and then cut from the tin can using tin snips. Each is then bent to shape in the vise. Holes are punched in the metal and the pieces are fastened to the base with wood screws. The position of the vibrator blade is checked to see if it can touch the coil head. The stop screw should be opposite the coil head. Insulation is removed from the wire ends, connections are made, the circuit is checked and then the buzzer is tested.

What has the child learned?

When the key was depressed, completing the circuit, current flows through the magnet. A field of force attracts the vibrator and pulls it over towards the coil. When the vibrator is pulled over, the electrical contact with the breaker screw is broken, the current cannot flow, the magnet field collapses, and the vibrator blade springs back to touch the breaker screw again. As long as the key is depressed, completing the circuit, the vibrator continues to bounce back and forth between the coil and the breaker screw, producing the buzzing sound. The child has had success with something he has made himself. It works.

The child has learned to cut metal with tin snips, to form metal by bending, and to make holes in metal by punching. He has driven screws. He has strengthened learnings in wood and electricity that he has learned before. Academic learning of abstracts has been made visual and concrete.

Mr. Baggs teaches at Wasatch Elementary School, Provo, Utah.

graphic arts

Teaching basic concepts with small equipment

Ervin A. Dennis

Students enrolled in graphic arts classes, whether it be junior, senior or post-high school, deserve to be introduced to graphic arts in such a way that it will be meaningful and exciting to them. Graphic arts is among the top ten largest manufacturing industries within the United States. This fact can be proven by comparing the number of manufacturing plants, number of employees, value added to the product, gross dollar volume and other comparative breakdowns; therefore, further justification of the need for introducing and teaching graphic arts to the young talent of our nation is not necessary.

The technological explosion in graphic arts and, for that matter, in all industry is threatening the traditionally organized industrial arts-graphic arts program. For example, "Have you noticed how the information explosion has and continues to threaten to bury the very person it is designed to help – you the reader?" Today, Americans are using paper at the rate of nearly 550 lbs. each per year. Where is all of this paper used? Take a look around right now or any place that you may be between now and the day you die. At least one thing will be in your sight that is constructed of paper or a paper-base product. It will also probably have some kind of a visual image reproduced on or in its surface. The image was placed there to communicate with you and anyone else who may observe the same item.

To prepare these many graphic arts products, new machines, processes and ideas have come to light in recent years. The computer is now playing a large part in the arts. Electronics has infiltrated this area to the extent that it is difficult to recognize or identify the object as belonging to the graphic arts. The laser and the cathode ray tube have also entered into this now-rapidly-developing industry that is involved with producing visual images that the people so desperately need. Of course, there still remains some of the old standard equipment, but it soon will or must give way to newly-designed devices.

All of this adds up to increased speed, a sharp rise in quality, and more and more material to read and digest. It seems that today there is a feeling that the more of or the bigger everything is, the better it must be. This thinking must be curtailed among our educational personnel and especially within our graphic arts educator ranks if well-balanced, broad technical programs are going to be offered.

An educational graphic arts structure. Because of the technological explosion that is presently and will continue to take place in the graphic arts, there is a definite need for formulating an educational structure and also for considering the usage of small equipment to teach basic concepts. Traditionally, graphic arts has been structured for educational purposes according to the basic printing processes – letterpress, lithography, gravure and screen process. Because of the similarities in each of these processes, there is a tremendous amount of overlay in the study of each process. Examples of these repetitions include the design and layout steps that are necessary when using any of these four basic printing methods; the composition methods, whether hot or cold, are also similar, since all four printing methods commonly require the use of photographic film negatives or positives, and the printing plates for each process have similarities.

By developing an educational structure (Figure 1), it is possible to analyze what should and has been taught. This structure was developed by Dr. Charles Thomas, chairman of the Department of Graphic Arts at Stout State University. A word of caution: Do not expect to adopt this exact structure for your school system because it may not work, but it is possible to adapt it to nearly any graphic arts situation. New names were developed for some of the areas because the rapidly-changing technology is demanding a comprehensive terminology. A structure of this design allows the graphic arts educator to determine those concepts that he desires to emphasize in his own particular program.

Basic concepts and equipment needs. Once the content for the graphic arts educational program has been determined and the basic concepts have been listed, it is possible to offer a comprehensive program by using small equipment rather than large equipment. Smaller equipment has the rather distinct advantage of being more economical to purchase, simpler for students to learn to operate, and fewer maintenance problems for the instructor.

Design and layout: Planning graphic material for multiple reproduction is the first and most important step in producing a graphic arts product. Design principles, color principles, type characteristics and layout procedures are but a few of the topics that should be studied within this area of graphic arts. This is the only production area within the graphic arts in which there is no equipment problem as compared to the size or kind of that used in industry. It is true, though, that elaborate drawing tables and cabinets are possible to obtain, but certainly not a necessity.

Composition: This area includes the assembly of alphabetical characters into usable and meaningful forms. No hot or cold method of assembling type should be overlooked when presenting information on methods of composition.

Within this area there is a definite problem in obtaining industrial-styled equipment, but it is possible to teach basic composition concepts with small equipment. Hand composition versus slug casters; impact (strike-on) composition can be taught with the typewriter versus the justifying composer; photographic composition can be taught with the small headline machine versus the high-speed text-producing system. Films and field trips will have to suffice for the composer-computer unit. If no equipment is available or possible to obtain, why not try the rub-on or dry transfer letters?

Photoconversion: After copy has been composed, either by hot or cold methods, it is becoming more common to prepare photographic film negatives and positives instead of using the type directly. Glossy photographs must be halftoned before they can be used with the basic printing processes. Other facets of photoconversion include that of preparing duotones and color separations.

To teach the basic concepts within this area, it is possible to select from a variety of equipment. The first decision on using a vertical or horizontal process camera must be made. If a vertical camera is chosen, a small compact unit can be used to accomplish the same basic objectives as that of a large darkroom-model vertical. If a horizontal camera is chosen, a small unit can be used instead of a large sophisticated model. If a normal darkroom is not available and a clothes closet or custodian's room must be used as the darkroom, possibly a small gallery horizontal model can be used.

Image carriers: These are the devices used literally to carry the images from the photographic film to the press and ultimately reproduce multiple copies. "Plates" is the term common to most graphic arts people, but because of today's breadth and depth in this phase or area of the graphic arts, the term "image carriers" is suggested as being more comprehensive.

Typical equipment within this area would include light tables and exposure frames. A small compact table-top light table can be used to teach the same basic concepts of masking and stripping work as a large floor-model line-up table. Also, a table-top pressure-type exposure unit can be used as effectively for exposing plates as well as a large floor-model flip-top exposure unit.

Image transfer: Within this area the procedures for the actual printing processes take place. Presses, whether letterpress, lithography, gravure or screen process, have many similarities; therefore, it is advisable to group the study of these into one area. The term "image transfer" is suggested for a title instead of presses or presswork because it is difficult to call some of the modern electrostatic reproduction devices "presses." These machines really do not press the image to the physical receptor, which is commonly paper, as do the presses of the other four basic printing processes.

Again, small equipment can be used very effectively to teach the basic concepts. For example, the hand-operated platen press can be as effective as the hand-fed power platen press and, for that matter, the automatic plate press. In lithography, the small offset-litho duplicator can be used to teach the concepts that are involved in operating a large rather complicated lithography press. The etching press can be used to teach the theory and basic concepts of the gravure image transfer method which would, of course, simulate (somewhat poorly) a large gravure press in at least the basic way. The small screen process unit, consisting of the frame, base and squeegee, can be used effectively to teach the basic concepts of this image transfer method as compared with the large automatic-fed screen process press.

Finishing and binding: After printed copies have been produced by one of the major image transfer methods, normally something must be done to the copies to make them more usable. The finishing procedures of folding, cutting, perforating, drilling holes and gathering are involved. One of the several binding methods is also involved with a good portion of the printed materials. The term bookbinding does not seem to fit this area as well as either "finishing" or "finishing and binding."

Here again small equipment is recommended for teaching basic finishing and binding concepts, such as a small lever paper cutter as compared to a hydraulic paper cutter. Also, a small office folder can be used to teach the principles of buckling the sheet of paper to make a fold as compared to a large automatic-fed and multiple-fold paper folder. The hand-binding unit can be effective in teaching some of the basic binding procedures as compared to some of the large sophisticated binding equipment that is available.

Economics: As can easily be noted, the previous areas or divisions of the graphic arts have been or are connected with production of physical items. Within this area, the business phase of the graphic arts is emphasized. Estimating, cost control, labor controls and other financial and business problems are involved in economics.

A challenge to graphic arts educators. To have an effective graphic arts program, it is essential to plan very carefully the total graphic arts educational program before initiating any one phase or one course. It is also very essential to establish the program objectives, whether for general education or for vocational education. After these two major steps have been completed, it is then possible to determine the equipment needs.

From these few comments, it is hoped that the idea has been implanted that it is possible to accomplish educational objectives with small equipment. It is very likely that vocational people may feel that it is wise to have larger and more sophisticated models of the various equipment items. This, of course, will have to be a determination of each vocational education teacher. In either case, though, the graphic arts educator should survey his total program, look critically at his objectives, and then carefully select and, of course, eventually purchase the equipment. Remember, it is true in most cases that small equipment has the same basic ingredients, parts or shapes as the large models.

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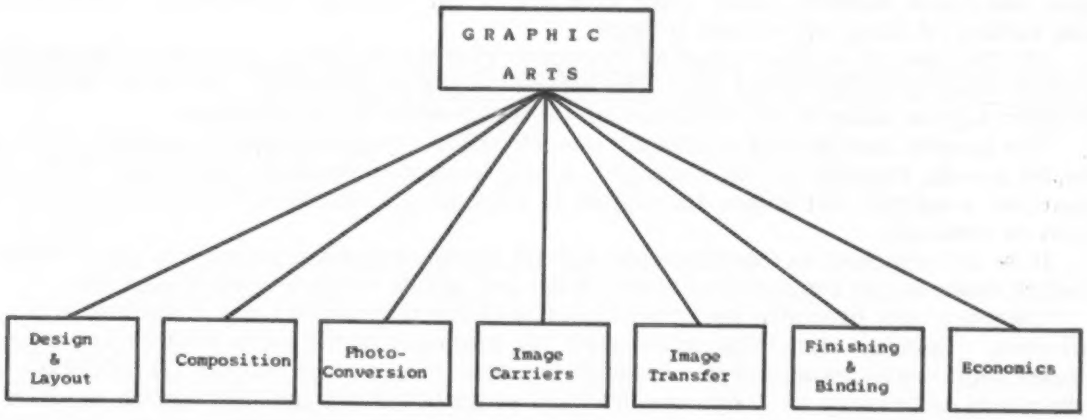
Figure 1



Educational innovations with photomechanical techniques

Parnik B. Hazarian

Today, man is probably experiencing one of the most exciting areas of his creation. The scientific achievements and technological advancements of the past decade have been nothing short of fantastic.

These advancements, as we know them today, are based on man's ability to transform his whole environment and, by so doing, to enjoy the highest form of technical culture the world has ever known.

It is generally agreed by educators that these rapid advances in space age technology have posed serious problems at all levels of education.

Many of these advancements have been made primarily as means of solving scientific and production problems; the technology was developed and then used as a tool towards further research. It would seem that we in the field of education have been, for some time, concerning ourselves with how we as teachers should tie this whole technological question into our curriculum. I wonder if we aren't just attempting to assist students in their adaptation to technological changes of today and the future, rather than utilizing these technological advances as a means of exploring our efforts in (1) researching alternative instructional methods; (2) identifying learning difficulties of the students; and (3) providing more individualized instructional programs.

What is being said is that we are reacting to these advancements in technology rather than using them to our advantage. Are we looking for mechanical devices which will provide simple answers to our complex instructional problems?

The area of graphic communications is no exception, as you well know. We deal with an industry that changes overnight. How do we enable ourselves to stay abreast of this industry? A teacher must be creative and must put forth great effort to coordinate his program with commercial art, art, journalism, photography and other subject areas.

I would like to share with you two innovations which I believe have helped our students to develop more creativity in the area of graphic communication and which have sufficient industrial application to command a place in our curriculum. Please bear in mind that what I am about to discuss may not be new to everyone, but it is currently being used with success among many of my colleagues.

(1) The use of contact screens for creations of contemporary moods and impressions. In case the term "contact screen" is new to you and you have no concept of what a contact screen is, a brief description may be helpful: Contact screens are composed of vignetted dots on a flexible film base support. Contact screens are used in direct contact with the high contrast film or paper on which the halftone is to be made. The contact screens are one of two colors: magenta or gray. There are magenta contact screens for making both halftone negatives and halftone positives. The gray contact screens can be used for making black and white halftone color separation negatives. Contact screens are available in a wide variety of sizes and screen rulings.

(2) The use of a color proofing system to give the student a good visual impression of what color printing would look like before the plates are made. As an art medium it has been a great asset in the development of creativeness in the students.

The graphic designer is constantly searching for new photographic methods to create special moods, feelings or impressions. A conventional photograph (black and white) may illustrate a subject, but unless its content is dramatic, it will do very little to convey the mood or message.

It is in response to this need that special photomechanical techniques have evolved. Most of these do not require elaborate equipment, but do require special screens.

Duotones are probably the most common of the techniques used to enliven ordinary halftones. Duotone is nothing more than two halftones of the same subject with rotated screen angles that avoid moire. Actually it can be much more. In normal halftone work it becomes necessary to compress the tonal scale of the original photograph in order to avoid loss of highlight detail. As a result, the shadow detail is often lost. In a properly-made duotone, the light color printer is photographed in such a manner as to hold all of the highlight detail; and, as no flash is given, shadow areas tend to go solid. The dark color printer is made also without flash, but is given greater exposure so there are full-tone separations in the shadows. Either screen or copy is rotated 30 degrees for each exposure to avoid any objectional pattern. With proper selection of ink colors, full detail will be found in both ends of the scale, and with an intermingling of colors that is quite attractive. Photos that lack details in the lightest and darkest area do not make effective duotones.

Similar to the duotone is the tritone. In this case, three halftone negatives are made from the original black-white photo. This technique is used to enliven the black and white photos when the rest of the job is running three- and four-color process. When using the three colors cyan, magenta and yellow, the duotone possibilities are limited to greens, oranges and the violets. The tritone concept enables one to achieve the greens, golds and lavenders as well. One negative is under-exposed, another over-exposed and one normal exposure. By selecting the appropriate colors for each, hundreds of combinations are available.

Special screen techniques. Modern technology has enabled the manufacturers to produce contact screens of various patterns, not only in the conventional patterns, but also in mezzotint, straight lines, wavy lines, bullseye and many more. Although most of these screens limit the detail and range of the halftone, the results are very pleasing for special effects. Not only are these contact screens useful for single-color work, but also for special rendering of duotones and process color as well.

Photo silhouette. Almost every camera operator has, at one time or another, inadvertently produced a photo silhouette. This occurs when a line negative is made from a continuous tone, the original comprised of varying tones of gray as well as black and white. While a photo silhouette is essentially a line reproduction, some skill is required. One must know where the tone should break to separate total blackness from pure white. It is also important that any subject, if it is a truly effective photo silhouette, be recognizable by its shape alone. Properly made and used, the photo silhouette provides exciting impact to any presentation.

Posterization. The technique which is known as posterization had its beginning in the screen processing industry. With older methods of screen making and the available inks, halftones, even of the coarse ruling variety, were virtually an impossibility. In order to create a variety of tones for use on poster work, a special technique was developed. This consisted of breaking the original down into broad, flat tone areas and printing a black and white subject in as many as six different grays, each a little deeper in color. Later this was done photographically, using a series of line exposures to provide this tone separation. Using these same principles and using screen tints and supplemental colors, the designers find that they can create photo art forms that are distinctive and attractive.

3M color key. A most recent innovation developed by the graphic designers is the utilization of the 3M color key proofing system as an art medium. The overlay film proofing system was originally developed as a printer's imaging tool. When color separations are exposed to corresponding sheets of black, cyan, yellow and magenta color key, the resultant proof on clear polyester film can be overlaid in register to give the designer a good visual impression of what color printing will look like even before the offset plates are made.

Through a series of experimentation of the 3M color key, the artists and graphic designers found the transparent proofing sheet to be an ideal material with which to make a comprehensive package design. Also the film is flexible enough to wrap around boxes, cans and all types of containers to give the designer a visual impression of what the container or the product will look like before it goes into actual production.

The learning experiences involved in the use of contemporary photomechanical processes and the use of color proofing system as an art medium become valuable tools in the hands of a creative instructor and his students.

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An interdisciplinary approach to visual communications

C. Eugene Strandberg

The general topic of our session – "Re-Focusing Instruction in Graphic Arts" – seems quite pertinent in view of recent educational and industrial activity in communications. This topic also implies that graphic arts teachers might re-evaluate their present standards of instruction and attitudes toward their educational environment.

We are well acquainted with the term printing and the technology for which it presently stands. Some of us teach printing for printing's sake. We tend to ignore related fields such as paper and ink production. Management decisions do not interest us. Electronics and instrumentation are neglected. The term graphic arts is often applied to the crafts teacher and his activities. The printing teacher may find himself entangled in an equipment-production syndrome which substitutes for educational objectives and creativity.

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Words tend to become ambiguous at best. A visual is an object, symbol or form of action which may be seen. This stimulus evokes a form of communication between persons. This visual enables us to recognize more clearly the relationship of printing, graphic arts, graphic communications and visual communications.

Visual communications: interpretation of visual stimuli for increased understanding
Graphic communications: graphic media of expression and comprehension
Graphic arts: printing and allied activities
Printing: the process of placing an image on a carrier

Printing is the technical process of placing an image on a carrier. A powder may be used instead of ink to image a carrier. The carrier will hold still long enough for the image to be transferred. Electrostatic printing can place an image on shaving cream foam or a raw egg yolk. The term printing seems to have become quite restrictive in its general sense.

Graphic arts is a broader term simply because it includes printing and related allied activities. This term is sometimes regarded as the antithesis of printing. We seldom hear of a vocational graphic arts curriculum. Graphic arts is generally regarded as an industrial arts rather than as a vocational term.

Graphic communications is a step from graphic arts towards visual communications. This type of communication is particularly well-suited to industrial education. The word graphic implies writing or written. A sketch, blueprint or computer print-out is more accurate and permanent than a verbal directive. Printing, graphics, design, computer technology and art contribute to the emerging concept of graphic communications.

Visual communications is the interpretation of visual stimuli for enhanced comprehension. The entire world—and beyond—has become our "neighborhood." Today's children see live communication from a quarter of a million miles away. Our own childhood was devoid of television. The entire concept of instant communication with other nations was foreign to us just a few years ago.

Dr. Ray Schwalm write "that the impending information expansion and the problems involved in inter-cultural visual communication will be far greater in the next generation." Communication as it now exists in its cultural graphic form does not have the capability to expand with communications technology.

Intra-disciplinary activities. Industrial arts education continues to maintain a fixation upon material-based instruction. Students study materials in great depth. Their knowledge and proficiency in a selected area are often quite high. The real continuity between the various areas of industry is often ignored. The graphic arts teacher is able to extend his activities beyond his own laboratory with little effort. The problems of communications face all academic disciplines.

Graphic arts has an inherent value to nearly all other industrial arts areas. The only force separating multiple-area activity is the teacher. Graphic arts teachers could easily extend their influence into electronics, woods, metals, graphics, design and photography.

The area most closely related to graphic arts is industrial graphics and design. Both use the written word, photograph or symbol as a primary means of communication. Industrial graphics is the very means by which many persons communicate. The complexity of our sociological and industrial structures will increase beyond present bounds. A graphic visual is readily interpreted and comprehended. The computer improves the mode of communication between man and machine. The applications of this electronic marvel should be increasing.

Electronics laboratories make extensive use of specially-prepared printed circuits. Schematics are essential in electronic experimentation. Miniaturized circuitry may be more easily explained and understood in an enlarged form. Chemical decoration and etching of metal may be done through intra-area activity. Students should be able to experiment with the facilities and materials of each area. Wood grain finishes are often prepared photographically. Odorous additives are mixed with inks to enhance a particular design. Industrial photography appears to be one of the most exciting, interesting areas emerging within industry.

Inter-disciplinary activities. Art departments tend to reflect independence and creativity. This discipline is generally oriented toward the abstract as well as the concrete. Designers should work closely with graphic artists. Color, layout, typography, letter form and illustration techniques are important to the designer and printer. The graphic designer needs a basic comprehension of the methods of graphic reproduction. The graphic artist in turn needs an understanding of the environment of our designers.

Initial reaction toward a graphic arts-special education relationship would probably be negative. If such a relationship exists – just where does it begin? The slow reader may be further hindered by image size and style; line length and spacing; capitals; lower case, italic and bold images; spatial arrangement; and other typographic principles that go unnoticed by the majority of persons. Children with special problems, whether functional or organic, need special help. Every sensory channel must be utilized to reach these children. Those with visual perceptual problems present a particular challenge for the use of visuals.

Speech pathologists work with persons afflicted with communications disorders. These persons may fail to develop language proficiency for many reasons. Hard of hearing and deaf persons are forced to use only the visual channel for communication. A person's visual perception may be an indicator of his overall neurological development. Recent research has shown that the particular visual used to evoke language samples has a significant influence on the length and complexity of the utterance. There appears to be a direct relationship between verbal development and visual sequential experiences. These visual experiences may originate in a graphic arts laboratory.

Graphic arts and physics students share the same technical interest in the properties of light waves. The physicist can demonstrate the visible spectrum. Graphic arts photo-conversion may provide unique learning experiences for physics students. Both disciplines experiment with light waves and their various physical properties.

The most rapidly-growing method of printing is offset lithography. This method is based upon the chemical premise that grease and water will not mix. The moisture part of this principle is governed by its relative pH. Chemistry and graphic arts students should understand the relationship between pH equivalencies in addition to the acidic or base condition of fountain ingredients. Chemistry plays an important part in the research and development of inks and papers.

Journalism students may not understand how their efforts are transformed into images. This discipline should have the opportunity for an especially close relationship with the graphic arts. The processes of image assembly, photo-conversion, carrier preparation and image transfer are integral parts of journalistic experiences. The need for communication between the graphic arts-journalism groups is apparent. The culmination of these combined activities is communication – graphic communications in a visual form.

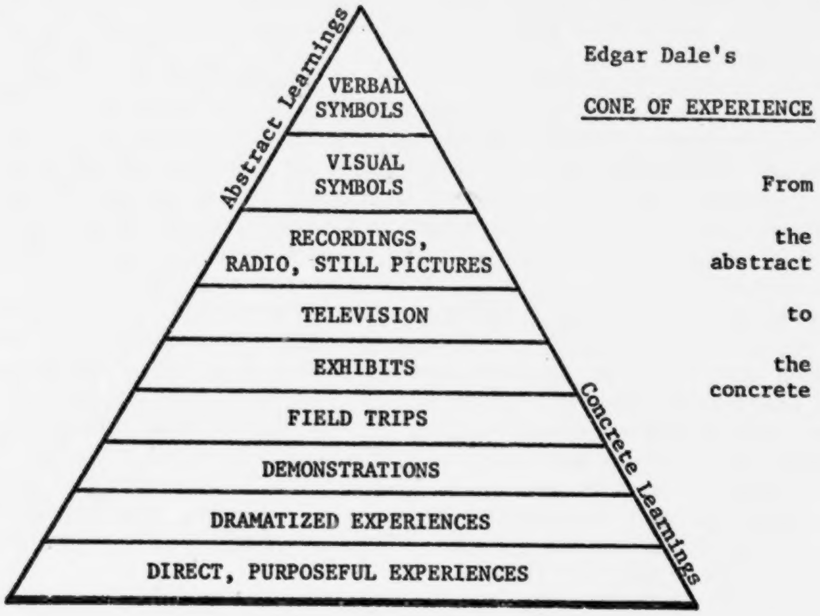
Audio-visual activities have become less service-oriented and more academically-inclined. This discipline affords a great degree of opportunity for the interchange of personnel, concepts and materials. Graphic arts persons share their interest in photography, projection, image assembly and reproduction.

Graphic design requires a knowledge and application of psychological principles. Color, form, direction, movement and sensory perception are essential to improved communications. Man is a single-channel communicator. Multiple-channel communication simply permits a person to choose his means. The improvement of visual comprehension is encompassed by psychological implications.

The graphic arts industry is the foundation of visual communications. Most visuals require some form of graphic arts activity. To the student of graphic arts, the printed sheet is a tangible goal motivating the youngster. The use of modern materials and equipment creates a sense of relevance and pertinence of life today. The learning experiences associated with the graphic arts are an essential part of the general education of youth.

The emerging concept of visual literacy. Every moment of every day places us in communication with our environment. Most communication is so unconscious that we are unaware of its occurrence. We tend to think that communication is primarily verbal. Much of our communication is in the form of spoken and written words. An increasing amount of communication with our environment is basically visual. We react and interact with things we see, whether these things are inanimate objects, or the actions and expressions of people. Our verbal messages are largely based on our perceptions of the visual realities in our environment. What we say tends to be based on what we see.

We communicate in many ways: Gestures, signs, symbols and words. We are exposed to the visual world long before we learn the intricacies of the verbal world. A child is exposed to visual stimuli from the world about him. Visual communication is more than the use of audio-visual techniques to illustrate a subject or dramatize an event. The type of visual communication of which we speak is not the exclusive province of the teacher. Visual communication is student-centered. Although teachers may use materials designed to increase visual acuity and sensitivity, and to involve visual learning in language curricula, the student is the one who must learn visual language. Visual communication might be considered analogous to spoken and written language because it is spoken and written. It needs to be developed, practiced, read and written, as does a verbal language. Dale's Cone of Experience is indicative of this basic visual philosophy.



These are designations that bear no physical resemblance to the objects or ideas which they represent. All appearances have been removed from the original. The word "horse" does not look like a horse or feel like a horse. The term "weather" reproduces none of the hundreds of specific experiences directly related to its meaning. At the pinnacle of the cone we have abstracted everything from the original except the meaning of the term, and on this meaning we have reached more or less common agreement.[1]

Marshall McLuhan and others feel that the study of visual communication is both an immediate and pressing urgency. Today's child prefers to learn through visuals rather than through words. Neither one of these avenues to literacy is more important than another. When a student becomes proficient in understanding and using visual language, he will be better able to manipulate verbal language. We need to use all the modes of producing and consuming ideas. They reinforce each other and provide additional rich associations which make the filing, reconstruction and retrieval of ideas more effective. Visuals uncover special abilities of pupils who may lack competence in one phase of communication but who are especially adept in another.

Visual communications and the philosophy for which it stands is not accepted by many graphic arts persons simply because of its apparent complexity as an educational activity. Visual communications is not an academic discipline per se. Existing disciplines need only slight redirection to complement the basic philosophy of visual communications. Emphasis should be directed toward the exploration of various disciplines for their contributory value to the concept of communicating visually. The basic sciences, art, design, graphic arts, behavioral sciences and related areas are contributive because of their inherent relationship to the processes of communication.

Visual communications does not seek to replace the graphic arts or printing programs that now exist. It enhances their presence by becoming an adjunct to their activities. Dr. Schwalm established four categories of formal instruction: two-year programs for secondary students, one terminal, the other university preparatory; a two-year post-secondary technical communications program; and a baccalaureate teacher education curriculum. Graphic arts as we know and teach this area is the most integral part of visual communications. This philosophy can only improve the image and influence of graphic arts education.

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[1] Edgar Dale, Audio-Visual Methods in Teaching, Revised Edition, NY, 1954.

Dr. Schwalm also categorized visual communications as the visualization of concepts through the use of visuals; the reproduction of this visual information for storage and immediate use; the techniques of visual presentation; and the recording, storing, retrieval and rapid reproduction of this information. Visual communications education does not produce highly-skilled technicians. Its purpose is to provide experiences and activities in the fields closely related to the problems and processes of communicating visually.

Skills which are emphasized now will probably no longer exist with finality in our rapidly-changing technological world. The most sound education policy would be to provide the student with the capability to readjust readily to these impending changes rather than to experience the traumas of social and technological obsolescence.

Immediate and practical applications of visual communications concepts.

(1) Make enlargement and reduction prints of working drawings. Prepare transparencies, file negatives and positives for the graphics teacher. Illustrate photographically the difference between inked and penciled lines. Show the necessity of neatness and accuracy in graphic copy preparation.

(2) Show electronics students how masking materials are hand-cut for the preparation of special printed circuits. Photo-convert and make usable circuits for the electronics laboratory. Enlarge miniature circuitry for greater clarity in learning.

(3) Metal decoration and etching may be done with photographically-prepared images. The processes of film exposure, development and printing are not familiar to most industrial education students outside of the graphic arts.

(4) Bring art students and instructors into the laboratory. Illustrate the processes of copy preparation, image assembly, photo-conversion, image carrier preparation and image transfer. Many art students are now aware of the processes of converting their work into reproduction form. Art persons in turn can apply their creativity and talents to production and project work in the laboratory.

(5) Special education teachers and students find useful information regarding the appropriate line length and spacing, image size and style, image form and spatial arrangement. Speech pathology persons are interested in the preparation of visuals, such as photographs and other stimuli.

(6) The properties of light interest physics students. Chemistry students could see a practical application of the values of pH in fountain solutions. Bring these basic science students into the graphic arts laboratory. Densitometers and pH meters suddenly appear as realistic instruments of industry.

(7) Journalism students need to understand the language, practices, procedures and trends of the graphic arts. Their activities culminate in graphic reproduction.

(8) The graphic arts laboratory is an ideal place for audio-visual persons to extend their understanding of visual reproduction. Much of the effort expended by these persons involves the principles of layout and design, image assembly and photo-conversion.

(9) Graphic designers depend upon the graphic arts for the reproduction of their efforts. Here again is an excellent opportunity to extend the influence of the graphic arts in the educational system.

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plastics

Plastics find applications in metals processes

Gerald D. Bailey

It is difficult to change a curriculum package in industrial arts such as metalworking, especially where there is a history of instruction based on manual training methodology. Even though industrial arts subject areas are generally project-oriented, they are also limited in most schools to work with a single basic material or process, i.e., wood, metal, plastic, graphics. Within the basic subject areas of the industrial arts, an instructor has a real battle to keep up with the exploding technology. Even to keep up with one area of the metalworking field, such as metal casting, can be a full-time occupation.

How can we expect the metals instructor to become concerned with plastics, or the photo instructor to become involved in other areas of graphic arts? An examination of any of the areas of instruction in the industrial arts within its industrial reference frame shows an interplay of materials and processes that is difficult to by-pass, especially in the development of curriculum.

The concern here is strictly an example and relates the areas of metalworking and plastics. The key means by which the industry keeps up with new developments and applications of materials and processes is through trade and engineering journals and books, although the books are usually several years behind and oriented to engineering aspects of the technology. Some typical examples of magazines or journals in the areas of concern include: Metal Finishing, Modern Castings, Materials Engineering, Modern Plastics and Plastics Technology. It is a difficult task for any teacher to take even one of these publications and incorporate the appropriate subject matter into the instructional program during any given year. Yet each of them contains relevant material that must somehow be developed and included. Many of these publications are developing a cross-referencing of areas of application, because metal workers are interested in plastics and ceramics, processors are increasingly concerned with several basic materials, and engineers are accepting a wider variety of materials and processes.

Look for a moment at plastics and metals and compare, for example, epoxy resin and aluminum. Strength-weight ratios are comparable; service temperature is higher for aluminum, but epoxies are working effectively at the 400-500 degree range; chemical resistance favors the epoxy; abrasive resistance depends on alloy of aluminum or reinforcement of material; dielectric properties are opposite. The uniqueness of the physical and mechanical properties of each of these materials and others requires careful examination before a material can be properly selected for a given job. An added dimension of the plastic materials is the characteristic of being either thermoplastic or thermo-set plastic.

But what does all this have to do with metalworking processes in industry, where the concern is with layout and fabrication, metal casting, tooling, machining and finishing? The plastic processes and materials are important to the metals area of work because of their relationship to metal processing, their uniqueness and, in some cases, simply because they offer an excellent vehicle for instruction in a metals area. For example, layout techniques are basically the same with all structural materials. Sheet metal workers, for example, are being called on more frequently to handle sheet plastic materials. Mechanical fastening devices are the same for sheet metal and sheet plastic. Gas welding of thermoplastic sheet is done by the same techniques as are used for oxy-acetylene welding of metals. Resistance welding processes are also very similar in application. Adhesive bonding of plastic and metals in various types of composite structures, such as aircraft wing panels with honeycomb cores, is an accepted engineering technique for production of high-strength, low-weight units.

Plastics have found wide application in the metal casting field in both pattern-making and molding operations. In addition, plastic resins are molded by techniques that are almost identical to metal casting processes. Cast and reinforced resins are an excellent pattern material. They can provide close tolerance and long mold life at low cost. They are especially valuable for short-run production where metal molds are not practical. Fabrication of plastic patterns is in many cases much less expensive than wood or metal patterns. In addition, plastic resins are excellent for repairing damaged wood or metal patterns.

The "lost pattern process" uses low-density styrene or urethane foam as a pattern that doesn't need to be removed from the molding sand prior to pouring the molten metal. This technique is particularly advantageous for short runs but has been adapted to mass production in selected industries.

The use of plastic resins as binders for rigid molds in the shell process has given the metal casting industry the capability of consistent precision in mass production in dimensional tolerance and surface finish. Shell molding has helped move metal casting processes from the "state of the art" to where they can be considered a science.

The injection molding of plastics and die-casting of aluminum and zinc are nearly identical processes. Mold designs and machine operating temperatures are the only significant differences.

The development of tooling fixtures has always been a time-consuming and costly operation regardless of the type of process involved. Cast, reinforced or even thermoformed plastic parts for use as machine holding fixtures, check blocks, or test units for quality control, can be developed rapidly at minimal cost. Their accuracy and strength can be set according to specific needs.

Each family of plastic materials has its characteristic strength, hardness, brittleness, etc. Their unique physical properties are not hard to note when the materials are being worked in the machine shop. Cutting tool speed, feed and depth of cut must vary significantly with each family of material, just as they do with various metals. Cutting tool design must also be adapted to the material. Correct rake, clearance and cutting angles are required to produce desired accuracy and machined surface finish.

The development of metal tooling in the machine shop for plastic molding processes offers a real challenge to the beginning or apprentice machinist. Students who have an opportunity to develop a simple injection, compression or transfer mold for production of plastic parts may continue into tool and die work, a field that has remained on the critical occupation list for many years. The development of metal tooling for plastic molding processes provides real opportunities for practical applications of unique processes, such as chemical and photo etching and electric discharge machining, as well as common hand processes, such as polishing with abrasives.

One of the most neglected areas of instruction in the metals program has been in the finishing of metal products. Plastic coatings are used as resists in chemical etching and finishing processes as well as for surface coatings for protective and decorative purposes. Coatings may be painted, dipped or sprayed on from several of the families of materials. Dispersion coating with vinyl plastisols is a common application that duplicates a major plastic processing technique for production of soft or flexible parts. Dispersion coatings are used for both protective and decorative purposes and may be temporary or permanent. Newly-sharpened tools are frequently dipped in a thermo-plastic resin that sets when cooled, providing a protective shield over the sharp edge and preventing corrosion while in storage. Recent experiments with plastic film finishes have produced coatings for steel sheet that permit the sheet metal to be formed after the finish coating is applied. Resistance welding techniques have been refined to permit the assembly of these pre-finished while still in the raw or roll form, shaped and trimmed by magnetic, explosive or mechanical forming, assembled by resistance welding, and ready for sales with no further finishing required.

In the areas of metallurgy and quality control, plastics serve several purposes. Specimens are mounted in thermoset resins and polished for microscopic inspection. Checking tools and test units are fabricated from various types of plastic resins, some of which have much smaller coefficients of expansion and contraction than most metals. Methods of testing plastics for quality fabrication are similar to those used for metals and include processes such as die penitrant, inspection, tensil testing, ultrasonic measurement, and X-Ray inspection.

These examples of similarity between processes and materials and opportunity for use of plastic material to illustrate or facilitate the teaching method or content to be learned probably will not send very many of you on a crusade for change. They should, however, illustrate the need for your awareness of the materials we call plastic; of its diversity and importance to the industrial process; that the epoxies are as different from polyethylene as aluminum is from stainless steel, or as walnut is from poplar. These differences are important in the selection of a plastic material for specific application and effect total engineering of parts or products from conception and design through material selection, production phases, finishing and marketing procedures.

The advance state of material technology relates materials to each other in various processing techniques. Combinations of materials and process technology have given engineering and industrial processing a whole new spectrum of material capabilities. As use of each type of material is advanced and its properties are more fully uncovered, the "state of the art" becomes more a science.

If you are not exploring in these areas as a means of vitalizing your instructional program, it is becoming more and more irrelevant with each passing day.

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Plastics in a school program

LaVell C. Garnett

In a little more than one hundred years, plastics production has increased from zero, in 1968, to 15.1 billion pounds in 1969. These plastics are divided into two family groups – thermo-plastics and thermosets – and are produced by five main processes: (1) molding, (2) casting, (3) thermoforming, (4) reinforcing and (5) foaming.

Molding is divided into eight main areas: (1) Compression, (2) transfer, (3) injection, (4) extrusion, (5) blow, (6) calendaring, (7) laminating and (8) cold molding.

In the schools, the role of plastics instruction is to inform and train the students in these processes so that they will be prepared to take their place in industry.

The presentation I have prepared is to demonstrate how a plastics training program can function on a secondary or university level. I hope to convey to you the ways in which a program of this type can be started on a minimum budget and gradually build into a program comparable to that of woods or metals.

Many projects or exercises can be produced in the school shop to give a student an understanding of the industrial processes.

Any typical wood shop furnishes a working laboratory for industrial plastics with the addition of a supporting plastic machine area, which should be isolated enough to prevent a dust problem. In our situation, the plastic equipment is located in what was once the wood project storage room.

Simple thermoforming is a good area in which to begin a plastics program.

A good gift for any young man might be the Vac-U-Form, or it could be used as an excellent demonstration piece for the classroom.

The addition of the "Dymo" forming machine provides for sign-making and skin-packaging units. The student can see its application every time he goes into the supermarket.

The "Di-Acro" thermoforming press is most helpful, because the student is able to produce his own molds and learn the thermoforming processes. He learns how plastic is held while being heated and formed and the necessity for a cooling period to keep the plastic from warping. How pleased he is when the product he designed turns out so well!

The "AAA" thermoformer is designed more as an industrial machine. It has larger mold capacity and timing devices, and provides application of the principle of plug, blow and vacuum.

Sometimes equipment cost hinders the instructor from becoming involved in a new area of work, but after an analysis of some of the processes, ways can be developed to move ahead.

A student version of a thermoforming machine uses a shop-constructed heating unit, a used vacuum cleaner, and a platen arrangement similar to the "Di-Acro" thermoformer. The clamp frame works on the same principle as the "Dymo" thermoformer.

Another student version uses the same principle as the "Di-Acro" with its overhead heating unit. The same mold, with the addition of a bottom, used in the "Di-Acro", provides the vacuum box. A shop vacuum hose, attached to the mold, provides the vacuum unit.

A round hot plate can substitute for other kinds of heaters for heating the plastic.

Building a clamp frame for holding the plastic serves to create another problem situation.

Realizing that most vacuum cleaners will blow and vacuum, students can soon figure how both these principles can be applied for practical use. Simply tell them to use a sliding mechanism to change the direction of the air to the vacuum box.

Plaster molds provide an inexpensive mold for plastics in areas such as casting, foaming and reinforced lay-ups. Of interest to students is the mold cavity.

Ultracal and hydrocal, together with Epoxical, are industrial tooling materials.

The plaster mold also provides a place to experiment with the important foaming process. Two chemicals are mixed together, a hardener and a resin, which expand to about 40 times their volume. Safety requires that you do not forget the sprue release hole.

Polystyrene beads provide us with insulation and shock-proof packaging material. Popular projects are available which will hold student interest.

The "Vega Rotomolder" gives us an experimental molder. With the use of polyethylene powder and vinyl dispersions, many interesting applications can be made. Industry-wide, this is becoming an important process.

Casting polyester resins and dip-casting with plastisol provides experiences in craft work as well as in the industrial coating process. Coatings of wire materials and tools can be seen on every hand.

The plastics industry would not exist if we did not have the proper tooling. Die making is a most essential part of this industry.

The "Armstrong" vibro fluidizer gives us a small unit for demonstrating fluidizing. When an object is heated and placed in a fluidized bed, it becomes coated with the powder used. Epoxy provides a high di-electric coating.

Fiberglass is so common that it hardly seems like a new process. On every hand we can see its application. Hand lay-up can easily be taught in any school program. Many students' molds can be prepared at a small cost. More important for industrial applications is the matched mold. Two simple methods of matching the molds can be accomplished by rectangular or round forms.

As a toy, Kenner provides an injection machine. With a little wax, parts can be injected in the polyethylene molds. The "Honajector" is a small machine for this process. Many student molds can be made for this machine.

The "Unex-Jet" provides a little greater shot capacity and is a little more rugged for class use. Injection molding produces a great volume of the plastic articles found on the store counter. No program would be complete without showing this process.

Bakelite was one of the first plastics produced. As a thermoset, it is formed by heat and pressure. The "Vega" press provides a good opportunity for experimental work in production control. Nearly all switch gear is produced from the thermosets by either transfer or compression molding.

Extrusion and blow molding provide nearly all of the bottles and containers we find on the grocery shelf. We would really take a step backward without this process. Practically every plastic bag is produced by the blow molder.

The "Ball" granulator makes it possible for us to reuse nearly all of our waste thermoformed sheets. These are re-ground and used for injection molding. Every industrial manufacturing unit provides for re-use of its scrap materials.

Welding by super-heated hot air gives us a means of fabrication. In duct work, this is important. Ultrasonic welding also is becoming increasingly more important.

Industrial plastics can and should be an important part of industrial arts. The challenge is for you to become informed.

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Injection molding in the junior high school

John W. Nidzgorski

The phenomenal growth of the plastics industry in the last twenty-five years has demonstrated the dynamic character of this industry. The production of plastics and resin materials has increased from four and one-half billion pounds in 1958 to fifteen and one-half billion pounds in 1968. This growth is expected to continue, and many experts predict that by the late 1970's we will enter the "plastic age", that is, the time when plastics will be used in greater quantity than all other materials combined. This growth will depend upon the availability of qualified personnel to fill the demands of the industry. Is it not our educational responsibility to expose our students to as many plastics experiences as possible?

Most of us would agree that industrial arts is one of the subjects that could provide positive direction and ignite the spark of interest to enable our students to discover their talents, or lack of them. Our students should be motivated in an action program where their efforts can be seen in the form of projects that each one has designed and constructed. We would then be in a position to give practical guidance to the individual.

There are many industrial plastics experiences that are now available to us. It would be your responsibility to select those that fit into your particular program. However, I would urge you not to include only one area and then claim to teach plastics. My specific assignment for this meeting is to discuss injection molding at the junior high school level.

I first became interested in injection molding when a personal friend entered the plastics industry about eight years ago. Whenever we met we would discuss and often argue the merits of wood versus plastics. (My industrial and teaching experiences were primarily in the woodworking field.) He must have been very persuasive, because a few years later I started teaching industrial plastics in a shop that had all woodworking equipment in it. My first experience of any type was with injection molding. However, I would recommend that you start your plastics programs with either thermoforming or expandable polystyrene, because they are considerably less expensive and do not seem to require as much background and experimentation.

Injection molding is the most widely-used process for making plastics products. In this procedure the heat- and work-softened moldable material is forced into a mold where it hardens while held under the high molding pressure forming the part.

The injection molding machine was invented in 1870 by two men named Locke and Smith and was used for metals. Hyatt, the man who was questionably credited with discovering plastics in 1868, invented the first plastics injection molder in 1872. The early machines were hand-powered and were quickly followed by mechanical clamp and hydraulic injection – plus automatic timing sequence and temperature control.

Most modern machines use an extrusion-type screw to mechanically- and heat-plasticize the material and then move axially to inject the material into the mold. Such machines are called in-line reciprocating-screw injection molders. Smaller machines – and especially the type that you might consider for a school shop – use a plunger or ram or piston to move the material vertically. Machines vary in size from fractional ounces to many hundreds of ounces per shot.

There are many practical applications where you can use injection molding in your school shops. You might use it as a vehicle in a separate plastics course to demonstrate a very important method of processing plastics. You might also use it as part of a true general shop and have your students exposed to this important process. If you do any mass production in your shop, what better way is there to produce many items that are exactly the same?

We use our molder in a general shop situation to produce small colonial novelties such as eagles, stars and roosters for our students' woodworking projects. We have also molded pins, bottle caps, pennants, key chains, cake testers, etc. These have been used for promotional campaigns in school and at back-to-school nights. We have molded checkers, tic-tac-toe and Hi-Q pegs, and are now in the process of molding a chess set. The items to be molded are only limited by the capacity of your machine and the imagination of your students or yourself.

There are many different injection molders that are on the market today, varying in price from less than $200 up to many thousands of dollars, and each one has its own advantages. The molder that fits your individual requirements, limitations and budget is the one that you should purchase. When I started looking for an injection molder five years ago, there were only two makes available that I knew about. Many good machines were eliminated because we did not have any source of air available to operate the ram. I selected the Unex Jet for several reasons, but before I tell you, be assured that I am not now, nor have I ever been, on the payroll of any manufacturer and my statements are strictly personal. Cost was not a determining factor, because the jet cost twice as much as the competition. The deciding factors were capacity, ruggedness and a local manufacturer.

When I bought the machine, there was one ready-made mold available, and that is all you really need. I heard a particular sales pitch on several occasions that a particular molder was the machine to buy because there were many ready-made molds available and the teacher did not have to waste his time making molds. If you agree with the premise that the best way to teach woodworking is to buy ready-cut birdhouse kits and then have your students assemble them, then by all means, buy many ready-made molds and start molding. I would suggest that there is more to woodworking than assembling someone else's labors, and there is more to injection molding than using someone else's molds.

Why not have your students make their own molds? I have with me some samples of various injection-molded objects that were produced by students, in student-made molds, in a typical woodshop, by seventh-, eighth- and ninth-graders.

Our plastics program is based on the principle that mold-making is a very important part of the industry. There are many sophisticated methods for making molds, and many of them do not fit into the realm of junior high school industrial arts. We use four different methods in our shop and each has its advantages. The first type we experimented with was aluminum-filled epoxy. This is a rather expensive and time-consuming process and costs approximately four dollars for each attempt. The average mold takes five to ten hours to make, plus twenty-four hours to cure. Another problem is to locate a good original or master that is practical to mold. These masters could be commercially-available objects or might be student-made. The master can be made of wood, metal, plaster, plastic or any material that will not break down at 250 degrees F.

The master is fastened to a base plate and then coated with a mold release. A metal chase is then put around the master and the epoxy poured into it. This is then cured according to the manufacturer's instructions. After curing, the chase and master are removed and the surfaces are machined as flat as possible. (We use a disc sander.) Top plates are then attached and the sprue and runners cut with an end mill, drill or even a chisel. This epoxy method is capable of reproducing the finest detail, and therefore it is important that the master be in very good condition.

Another method we use is machining: Our machined molds are made of aluminum because it is so easy to work with and is strong enough to withstand our molding pressures. Our first machined mold, and one that I think was among our best, was made on a drill press by a seventh-grader. He used two blocks of aluminum and drilled a series of holes using a match plate for alignment of two different diameters. This four-cavity mold is used for molding small pegs that are used for tic-tac-toe and Hi-Q games. We have thus far molded thousands of these pegs.

Several years ago we bought a small metal working lathe that we use for mold making. Since then, a ninth-grade student turned the mold for a cake tester, which was also our first attempt at molding with an insert.

A third method is to combine epoxy and machining and use the advantages of each. The fourth type and probably the easiest of all is a plate mold. This can be used very effectively if you want to mold an object that is flat on opposite sides. All that is required is a jeweler's saw or scroll saw and a sheet of aluminum that is the same thickness as the object you want to mold. The shape and sprue are cut out, and then the plate is placed between two metal blocks. This entire assembly is then ready for molding. You can make a mold for a few pennies, and every student can try his hand at this process.

If any of you are ever back East, I cordially invite you to stop at my school and see an industrial plastics program that really works.

Mr. Nidzgorski teaches at West Brook Junior High School, Paramus, New Jersey.

Compression molding of plastics

Arnold C. Piersall

In simple terms, compression molding can be described as a process in which plastic molding material is heated and squeezed into the cavity of a mold, where it takes the shape of that cavity and is cured into a solid piece. More specifically, compression molding involves the application of heat and pressure to a mold which has been charged, or loaded, with uncured plastic molding material. The plastic, at this stage, may be in the form of powder, granules, pellets or preforms. The heat and pressure cause the plastic to undergo an irreversible chemical reaction. This reaction, which is known as polymerization, produces a change in the molecular structure of the plastic which converts the molding material to a solid, infusible, insoluble state.

The process consists of placing the uncured resin or charge in the cavity of a heated, open mold, closing the mold with the prescribed pressure and temperatures for a specified period of time, opening the mold and ejecting the part.

The compression molding process basically utilizes thermosetting resins. There are, however, exceptions to this rule, and in specific applications a thermoplastic material may be compression-molded. Examples of this exception would be phonograph records and fresnel lenses. The compression process provides the molding accuracy that is essential to satisfactory sound reproduction or accurate light transmission.

Compression molding is not used with thermoplastic materials if another molding process will produce satisfactory results. The reason is cost. Since thermoplastic materials harden by cooling, the thermoplastic part and the mold must be cooled before the part is removed from the mold in order to prevent distortion of the product. This slows down the cycle and increases the per-unit cost of the product.

The thermosetting resins that are to be compression-molded are available in a number of forms, such as powder, granules and pellets. In the plastics molding industry the typical mold usually requires an exact charge. In other words, each mold cavity requires an exact amount of material. This material can be measured by weighing, by use of a loading board or fixture that measures the material by volume, or the material may be preformed into "pills" of a predetermined size. Preforming can be done automatically, and it expedites the mold-leading process, since all the operator has to do is to count out the necessary number of preforms for any given mold cavity.

Many different kinds of thermosetting resins are used in compression molding, but the phenolics are considered to be the "work horse" of the compression molding industry. Most thermosetting resins are hydroscopic in nature and can absorb moisture from the atmosphere and, therefore, should be stored in a dry area. The maximum relative humidity in the storage area should be less than 65 per cent.

The temperature in the storage area should range from 65°F to 75°F. If the plastic is stored at temperatures lower than 65°F, the cure speed of the material may be affected. Higher temperatures may cause a slight degree of polymerization which will ultimately have an affect upon the flow properties of the material.(1)

The molds most commonly used in compression molding are classified as: (1) flash molds, (2) fully positive and (3) semi-positive molds.

Flash molds are the easiest to make and the least expensive of all compression molds. There is no telescoping action between the mold halves; therefore, some of the charge escapes from the mold cavity and forms a thin sheet of material outside of the mold cavity but between the mold halves. This material is referred to as flash – hence the name flash mold. Since some of the material is lost in flash, the charge must be larger than the amount of material required to make the part. A flash mold is well suited for thin flat parts. If material with a high bulk factor is being used, it may be necessary to incorporate a material well into the mold design. Bulk factor is defined as the ratio of the volume of loose molding powder to the volume of the same weight of resin after molding. The material well makes it possible to get an adequate charge of bulky molding material into the area of the mold cavity. Because they are comparatively easy to make, flash molds are probably the most practical type for school shop use.

Fully positive molds are the most difficult and expensive to make. The two mold halves telescope together, trapping the entire charge in the mold cavity. This type of mold produces dense parts and is an effective method of molding parts with heavy cross-sections.

As the name implies, a semi-positive mold involves some of the characteristics of a positive mold. In the beginning of the stroke, a semi-positive mold functions like a flash mold in allowing some of the charge to escape the mold cavity. As the mold continues to close, it reaches a point where the mold halves start to telescope. From this point on, the mold functions as a positive mold. The balance of the material in the mold cavity is trapped there and is formed into the part. The semi-positive mold will produce parts of higher density than will a flash mold but not as dense as a fully positive mold. The semi-positive mold is particularly well suited for deep parts requiring a long draw.

The moldmaker must be a highly skilled and knowledgeable individual. Molds for plastic parts frequently are extremely complex and, of course, must be built to very close tolerances. All of these factors increase the cost of the molds. It is not uncommon for a small mold to cost as much as an expensive automobile. A large mold may easily cost as much as a very sizable new home.

The compression molding process is most efficient when the material is preheated. Preheating is done in order to bring the temperature of the molding compound close to the molding temperature before it is placed in the mold. Preheating can be done in a circulating hot air oven, by infrared heat sources, or by radio frequency (dielectric) heating. Dielectric preheating is the most effective of the above-mentioned techniques; however, the equipment for this process is rather expensive. In most school applications, compression molding will be done without the benefit of preheating. The absence of preheating will slow down the molding cycle, but this is not critical in an industrial arts laboratory since volume production is not a major objective. Successful compression molding can be accomplished without preheating.

Without preheating the resin, compression molding of phenolics will require a minimum of 3,000 psi on the projected land area of the mold. The projected land area of a mold is computed by multiplying the width of the mold cavity by the length of mold cavity (including the land area) times the number of cavities. This minimum pressure requirement increases approximately 700 psi for each additional inch of depth of mold cavity over one inch. If the molding material is preheated, the minimum molding pressure may be as low as 1,000 psi, with an additional pressure of 250 psi for each inch of cavity depth over one inch. (2)

Temperatures for compression molding range from 280°F and 380°F. The specific temperature to be used in any given application will depend upon the type of material being molded, the geometric design of the part, the design of the mold and, as mentioned earlier, whether or not the material has been preheated.

The cure time is also dependent upon the type of material being used, the shape and size of the part, the temperature and the pressure. Time, temperature and pressure are interdependent factors in the compression molding process. Within reasonable limitations, compensation for a low molding temperature can be made by increasing the length of the cure cycle (time) or by increasing the molding pressure. Similarly, compensation for variations in molding pressure can be obtained by adjusting the temperature or the curing cycle (time). It must be remembered, of course, that the limits of these adjustments are somewhat narrow.

The discussion at this point will be restricted to hand molds. A hand mold is a mold that is designed to be lifted in and out of the press for part removal and reloading, as opposed to a mold that is bolted into a press and remains in the press – opening and closing with the platens of the press. The hand mold is placed in the press and is preheated. After the mold has reached the molding temperature, it is removed from the press and is opened, and mold release is applied to the mold cavity and the inner surfaces of the mold. The proper charge is placed in the mold, the mold is closed and returned to the press. The press is closed until the platens are just starting to apply pressure to the mold halves. Allow the mold to remain in this position for approximately 5 to 10 seconds and then release the pressure and allow the mold to open. This is referred to as breathing the mold. This allows trapped gas and air to escape from the mold. The mold is then closed and the press is brought up to the specified pressure and is held at that pressure for the required time. When the prescribed time has elapsed, the press is opened, the mold is removed from the press and is opened and the part ejected.

Some of the advantages claimed for the compression molding process include a limited amount of waste material, minimum finishing costs and the feasibility of molding large bulky parts.

The disadvantages include the difficulties encountered in the molding of intricate parts, small inserts, undercuts and small holes. It is also difficult to hold the molded part to close tolerances. Dimensional accuracy can be improved by a post-mold baking operation at temperatures between 200°F to 300°F for periods of up to four hours. The compression molded part should be uniformly dense and free of voids and blisters. The surface of the molded part should be an accurate reproduction of the mold surface. If the mold surface is polished, the product should have a smooth polished appearance. An analysis of the defects in a molded part can, in many cases, lead to the source of the problem.

Blisters in the molded part may indicate: (1) the presence of trapped air or gas, (2) moisture in the material, (3) a mold that is too hot, or (4) uneven heating of the mold. There are many defects in molded parts and each defect may be the result of a variety of causes. In many cases, one cause may be capable of producing a variety of defects. Charts are available that list common defects and possible causes. (3) Precuring and undercuring may produce surface finishes that are similar in appearance. If a part is placed in a mold at an excessively high temperature, the plastic may precure, that is, the polymerization may start to occur before the plastic becomes soft enough to flow. The material will form the part, but the outline of the plastic particles will be visible. A similar surface appearance will be obtained if the charge is undercured. Undercuring can be the result of insufficient molding temperature, time or pressure.

For school shop use, a hand-operated hydraulic press with heated platens is quite satisfactory. The platens should be thermostatically controlled. Obviously, the size of the press will be determined by the size of molds that are to be used. A press with 8 x 8-inch or 9 x 12-inch platens is very satisfactory for compression molding in industrial arts laboratories. The press must be capable of reaching minimum temperatures between 400°F and 450°F.

A compression press which is well-suited for school shop use can be purchased for less than $1,000. Simple flash molds can be readily made from mild steel. Industrial molds are made of tool steel, hardened and chrome-plated. This is not necessary for the limited runs that would be typical in an industrial arts program. If the mold design is limited to items of a circular shape, the entire mold can be machined on a metal lathe and a drill press. Students with a minimum background in machine shop can make compression molds that will be very successful. The product will not, of course, be any better than the mold in which it was made.

Why have students construct their own molds? A student learns a great deal more about compression molding or any other plastic molding process if he designs and makes his own tooling. In an introductory or survey-type course this would not be feasible. However, in a semester course in industrial plastics, many advantages would be realized by the student if he were provided the opportunity of making his own tooling. He will gain a much broader understanding of the plastics industry, and he will have a much greater appreciation for the time, effort and planning that must precede the molding of the first part.

FOOTNOTES

(1) Vaill, Edward W., Modern Plastics Encyclopedia (New York: McGraw-Hill, Inc., 1968), p. 715.

(2) Ibid.

(3) The Society of the Plastics Industry, Compression and Transfer Molding (New York, 1966), p. 13.

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Plastics training

Richard A. Reynolds

Clearfield Job Corps Center has been in operation since October, 1966, under the management of Thiokol Chemical Corporation. The Center, which is located on the site of a former Navy supply depot, has a student body of 1,300 young men between the ages of 17 and 21.

Vocational training at the Center involves these seven areas: Automotive, air conditioning/refrigeration, plastics, metals, food services, medical and agriculture.

Our trainees represent what has been called "the poor".... families that are unable to earn more than $3,000 a year.... families that hold little hope of upgrading their economic standards and rising above government welfare.

Still, each member of our student body carries within himself a common denominator: Each is tired of being tagged as "poor", and each is tired of being out of work and receiving handouts. Our trainees are not satisfied. They are anxious to upgrade themselves. And they want to make a contribution to their world and get away from charity and pity.

Thiokol accepted the challenge of pioneering this new educational approach for two key reasons: (1) To help these disadvantaged young men become productive tax-paying citizens, and (2) to help American business and industry meet its growing needs for skilled manpower.

Plastics was selected as a vocational training area at the Center because of the critical manpower shortage anticipated in the plastics industry within the next 10 years. Between 1965 and 1980, the growth rate of this industry is expected to exceed 700 percent, as recently reported in the SPE Journal, January, 1968, volume 24.

Moreover, Thiokol's production, research and development knowledge in chemicals and rocketry and its background in industrial training convinced corporate officers that skilled workers could be trained and placed in the rapidly-expanding plastics industry.

To the best of our knowledge, the plastics training facility at Thiokol's Clearfield Center is the largest in the United States. Shops and classrooms that accommodate between 200 and 250 trainees are arranged over 11,000 square feet of floor space. Modern and up-to-date equipment and machinery range from 1-1/2-ounce hand-operated laboratory injection molding equipment to fully-automatic production-type 75-ton compression molding units. In addition, a comprehensive reinforced plastics production facility and 6-ounce reciprocating screw injection molding machine are installed.

Equipment and supplies are valued at over $125,000. In addition, 2,000 square feet of warehouse space are used for storage of plastics materials and supplies.

Six vocational instructors with an aggregate industrial background of 50 years of plastics education and experience are assigned to the shops. Three additional educators are employed to support the vocational programs through plastics-oriented reading, mathematics, personal development, and other academic subjects which lead to certified high school graduation.

Trainees who select the plastics program for their future job devote eight hours to their schooling each weekday: Three hours to intensive shop training, three hours to academic training, one hour to avocational activities, and one hour to professionally supervised group counseling in their dormitories.

After a brief orientation regarding the plastics industry, trainees select an area of vocational specialization. The three major training areas available, and the representative hours required in each, are shown below.

Molded Plastics	780 hours
Reinforced Plastics	720 hours
Pattern-Making	750 hours

Graduation consists of successfully completing one of the above specialty areas, as well as prescribed academic, avocational and counseling activities. Should a trainee desire to continue his education and broaden his knowledge, he may enroll in a second vocational specialty area. Again, all training requirements must be completed before a Job Corps graduation diploma is awarded.

Each specialty area also contains three pre-graduation points to accommodate those trainees who desire to leave Job Corps without a graduation diploma. These pre-graduation points are carefully located in the curriculum to give each trainee the maximum job skills possible within the time he spends in Job Corps.

The key training mileposts within our three vocational specialty areas are presented in the following:

MOLDING
- Compression and Transfer Molding
- Inspection Molding
- Extrusion
- Thermoforming
- Rotational Molding
- Fluidized Bed Coating
- Hot Leaf Stamping
- Hot Air Welding
- Basic Fabricating Techniques

Within each of their mileposts, trainees receive instruction in these topics:
- Material Characteristics
- Molding Principles
- Safety
- Equipment Set-up Techniques

- Equipment Operation
- Basic Maintenance Procedures
- Die & Mold Design Requirements
- Quality Control
- Troubleshooting

REINFORCED PLASTICS

- Hand Lay-up
- Spray-up
- Vacuum Bagging
- (Trainees receive instruction in these topics.)
- Material Characteristics
- Safety
- Equipment Operation
- Equipment Care & Maintenance
- Personal Hygiene
- Material Preparation
- Laminating Techniques
- Finishing Techniques
- Troubleshooting
- Quality Control

PATTERN-MAKING

- Wood Plaster
- Plastic (Reinforced)
- (Trainees receive instruction in these topics.)
- Material Characteristics
- Geometric Construction
- Blueprint Reading
- Safety
- Personal Hygiene
- Tool & Equipment Care
- Power Tool Operation
- Woodworking Techniques
- Lay-out Techniques
- Plaster Casting & Sweeping Techniques
- RFP Laminating Techniques
- Template Fabrication Techniques
- Quality Control
- Troubleshooting

Plastics curriculum at the Center is organized to provide an integrated learning experience for each trainee. Reading, mathematics, personal development and language arts are taught as they relate to actual on-the-job circumstances.

One supervisor is responsible for the direction and standards of all vocational training and basic education efforts pertaining to plastics.

Other distinguishing features about Thiokol's plastics curriculum are:

Individual work stations are stressed.

Equipment, shop layouts and work procedures approximate those currently used throughout the industry.

Tolerances, standards and quality control measures reflect industrial standards.

Lecture-demonstration-do-evaluation learning sequences are followed directly in the shops. Emphasis is centered on doing activities, and large discussion groups are minimized in favor of more shop experience.

Most textbook procedures have been replaced with specially-prepared and up-to-date information handouts dealing with technology changes and advancements in the industry.

Prior to graduation from one of the three specialty areas, each trainee receives 45 days of actual off-Center work experience.

Thiokol's off-Center training is provided by the Plastics and Glass Shop at Hill Air Force Base, Ogden, Utah.

At this 80-man maintenance and repair facility, trainees receive direct experience assisting employees' work on the manufacture and repair of fiberglass-reinforced plastic aircraft and missile parts (e.g., radomes, ducts, electronic covers) and the fabrication of thermoplastic molded windows, canopies and light lenses. The trainees also gain first-hand experience using adhesive bonds, metal honeycomb, silicone rubber, plastic resins, epoxies, polyesters, urethanes and silicone foam.

Other off-Center work at Hill AFB involves polishing and replacing plexiglass panels in fighter aircraft enclosures; removing damaged windshield and canopy panels; cutting, fitting, drilling and bolting enclosure panels together; and testing panels for optical clarity, pressure and alignment.

Trainees acquire additional experience using hand tools, power hand tools and shop machinery, such as bench and band saws, jointers and sanders, drill presses, and injection and compression molding presses. Proper safety precautions, use of protective clothing, and storage procedures to eliminate fire and explosion hazards are also reviewed and checked.

To further prepare our trainees for employment in the plastics industry, Thiokol's placement office conducts a one-week pre-employment training course for outgoing trainees just prior to separation from Job Corps.

This course gives our graduating trainees a final review on these vital employment topics:

Finding a Job
Applications, Resumés and Questionnaires
Job Interviews
Management and Labor Unions
Employer-Employee Relations
Company Benefits and Programs
Manners and Appearance

Thiokol's placement staff also aids the graduating trainees with their arrangements for job interviews and conducts a comprehensive follow-up service in cooperation with National Job Corps offices.

Mr. Reynolds is with the Clearfield (Utah) Job Corps Center.

power technology

Generalizing power technology

Marion A. Brown

In thinking about any program area in industrial arts, we must think about objectives. The objectives used in Orange County, Florida, are:

(1) To develop insights and understandings of industry and its technology in our culture.

(2) To discover and develop interests and capabilities of students in technical and industrial fields.

(3) To develop the ability to use tools, materials and processes to solve technical problems involving the applications of science, mathematics and inventiveness.

To think about a program on power that will fit into these objectives, we must think about man and his accomplishments.

Man is a thinker. This sets him apart from all the other animals. Man's hands have a unique make-up, especially his thumb, which gives him greater control in doing things. Man thinks and uses his hands.

When man first started thinking and using his hands, he was limited as to what he could do because of his limited muscle strength. Many animals are stronger than man. Early man domesticated animals in order to give him more power to produce his material needs.

Some men became so efficient that they could produce more than sufficed for their needs. They shared the excess with others so the latter could spend their time in thinking. This thinking led to new "things" and new ways of doing tasks.

Each development has called for a greater concentration and/or distribution of power.

A study of this "capacity for action" deserves a place in our educational system.

What are some of the factors involved in this study? Power or energy may be in either a solid, liquid or a gaseous state, each having its own unique characteristics.

Sources of power may be either natural or manufactured. Natural sources are muscle, solar, wind, water, nuclear (either fusion or fission) and hydrocarbons, which can be coal and petroleum. Manufactured sources of power are compressed, generated or combusted either internally or externally.

Some may say this is science. It is when science is defined as "that what is". But when we think about the applications of scientific principles – this is technology. In studying technology, scientific principles must be understood. That is why they are stated here.

What are the "systems" used before power may be applied to a gainful use? Power must be stored, it must be controlled, it must be transmitted, it must be measured. Power is stored in tanks, bins, piles or batteries. Power is controlled through valves, switches, fuses, rods, tacking, gears, transformers or friction. Power is transmitted through wires, mechanical means or tubes. Power is measured by gauges, by many different types of meters and by weights.

Where are the applications of power? What are the needs for applying power where it will give the greatest benefits? There must be personnel who can organize, who can create, who can operate and who can maintain.

The creators have ideas which must be organized. They must be researched and developed. They must be planned, engineered and depicted and communicated.

These ideas are then converted into devices to be used in airplanes, autos, cycles, buses, conveyors, pipelines, rockets, trains, trucks, ships, capsules and other machines that use power sources.

The devices must have facilities such as airports, docks, garages, service stations, hangars, launch pads, depots, factories, railroads, etc.

These facilities fit into networks of airways, roadways, railways, seaways, spaceways and assembly lines. Safety and the economic aspects of industry are also a part of the network.

Mr. Brown is with the Orange County Board of Public Instruction, Orlando, Florida.

Power mechanics in the junior high school

Denny C. Davis

It is very rewarding to be able to be part of the pilot program being started in Orange County, Florida. I would like to give you some of my views on the program of power mechanics which is being started at Stonewall Jackson Junior High, Orlando, Florida.

Let me start by saying that I am very enthusiastic about and impressed with the proposed program in Orange County. We are finally able to make a distinction between industrial arts and what was termed before as "shop", other than in just the names. The reason for the distinction lies in what is being taught, the curriculum. It is more technical education. Industrial arts is in the public school system as general education, not vocational. In our program we are trying to give the student a broad look at as many different occupations or vocations as possible so that the student may better choose what he prefers to do or to become. We are not trying to teach vocational skills. Certain skills will be developed as a by-product, you might say, but will not be the program's main objective.

The power mechanics curriculum keeps the students interested. For sure the boys are interested in gasoline engines. Most of the boys are at the age where they are looking forward to driving a car. Quite a few of the boys are able to have motorcycles or go-carts. We use lawn-mower engines in our program and relate their principles to the multicylinder engines. While in internal combustion engines, the student will learn basic engine parts, two-and four-stroke cycle operation, fuel systems, lubrication, cooling systems and ignition systems.

The student is in an age now where rockets and the changes which they bring about affect his life constantly. I think the rocket section of the power program is quite sufficient. The student can make a rocket and fire it using the solid fuel-type commercial rocket engines. The student may not be able to fire the rocket during school, but it is still a good experience for him to make one and perhaps fire it at home. In this section the student learns of the different types of rocket propulsion beginning with their past history and working through to the future methods.

After rockets we followed up with the other types of engines. This would include the exhaust gas turbine, rotating combustion chamber, air-independent reaction and air-stream reaction. After learning the more common types of engines, it is easy for the student to transfer his ideas to those types just mentioned.

No course in power is complete without a study of electricity, and this is no exception, so we have included it here. The unit goes through the types, theories, symbols, diagrams, circuits, testing, magnetism and production of electricity. The applications of electricity are prominent everywhere, and it's not hard to get boys interested in electricity. The trick is to get them thinking that the subject is not a hard one and that they shouldn't have a fear of electricity. They should have a respect for it but not a fear of it.

There is a new field of power opening up in education today. This is the field of fluid power, hydraulics and pneumatics. In this field we cover the components, the circuits and their applications. Fluid power is a new field to the students and, being such, it holds their interest quite well. Being new, the equipment available for educational purposes at the present time is quite large and quite expensive. Our program hasn't adopted any special equipment in this area as of yet. We are working with a few companies to suit our needs.

For a teacher to carry on and support a program such as this he must really be on his toes. He must keep up-to-date on the advancements of the technological world. One good way is through NASA Tech Briefs. He needs a library in the room which should be kept up-to-date. There should be a bibliography of sources in information for the teacher. It is fast becoming an insult for an industrial arts teacher to be called a "shop" teacher, and the best way to avoid this is to keep the principal and other teachers aware of what is happening in industrial arts. We are trying to get away from the unit shop teaching method and give the student a broader outlook as to what is available to him.

Mr. Davis is an instructor at Stonewall Jackson Junior High School, Orlando, Florida.

Generalizing power mechanics in high school programs

James L. Grossnicklaus

One of the most controversial subjects today in our industrial arts curriculum is power mechanics. There have been several articles written the past few years on this subject, and at professional meetings it has been "picked" to pieces several times. We know it as power mechanics, but, as our technological society changes, so do the course titles. In IAVE, January, '69, there were two articles on power – one by our chairman today, Charles C. Rischer, and one by Terence J. Trudeau. Both are good articles. In the report by Trudeau, which came as a survey of NDEA recipients in power, names for power included power mechanics, power technology, transportation, auto mechanics, power or power and transportation, power and mechanics, fluid power, and small engines. According to his survey, power technology seems to be the title being used in more and more schools today.

Each power title no doubt has a different curriculum, and, consequently, schools without power in their curriculum are undecided about what to cover. Administrators and school boards are becoming more and more aware of this. A teacher will develop a power course for his school based on his ideas and knowledge of power. This teacher leaves, and a new one comes in who most likely has an altogether different philosophy of power. In turn, he changes the name and course content, because he feels emphasis should be put on another area of power, an area corresponding to his training and his background. This means changing facilities and tools. Not only is this costly and confusing to the district and students, but in some cases it still does not meet the demands of today's society. This happens over and over again. Not that changes should not be made, but let us try to be more consistent and practical to the community, to industry and to needs of society today.

Before deciding what to include in a power course, let us look at some factors too often overlooked. Several things make it impossible for every school to follow the same curriculum: (1) The school district and community, (2) the type of student involved, (3) the instructor, and (4) the question, would a course of problem-solving and practical experience be more beneficial or would theory and testing of sample components meet the needs?

Regardless of what the student is going to do after graduation, he should be allowed and encouraged to take some type of power course. Power will play an important part in his life, such as in transportation, home power tools, possible vocation. There is also the student who is vocationally interested in mechanics. Again in IAVE, January, '69, the editorial by John Feiser expresses this very clearly.

Schools are not providing opportunities for students to gain practical experience, do problem-solving and also explore the power area. Does your school encourage students to enroll in the power course, or is it looked on as a fix-it shop, or as a dumping ground for low achievers, or as a short-term course in theory only on all forms of power in which the student is still bewildered after completing the course?

The needs of the community should be included in designing the course. Even though it is an industrial arts course, allow practical and useful experiences to be a part of the course. Encourage participation from industry through use of advisory committees in power, and include teachers from academic courses to sit in on your courses. Your course is part of the school curriculum and should be placed on equal level with the rest of the courses being offered. The instructor should be aware of this in planning the course.

Teachers of power tend to cover only material familiar to them and often do not upgrade their programs to equal other courses offered in schools.

Some teacher training programs offer power courses, but, in many cases, due to lack of money and facilities, the course is taught using theory only. Thus high school power programs are suffering today. The teachers are confused and lack practical experience and definite guidelines to go by. Some companies offer summer courses in power mechanics for teachers. Seminars and evening classes are offered by institutions of higher education. The teacher should take advantage of these opportunities to upgrade himself. Think positively and try to develop well-rounded programs. The program won't develop itself. There are handicaps to overcome, but, with planning and initiative, these can generally be eliminated. Often teachers with little or no background in power are assigned to teach power. This isn't fair to the teachers nor the students, but it is being done throughout the country today in our industrial arts courses.

It is the instructor who should plan the facilities and tools for power. There are some well-equipped facilities in use today, but there are some more that are inadequately equipped, and some labs are too small to handle the school needs. Tool companies have developed "package" deals for power. The instructor should be aware of these bargain deals. Some schools purchase through a purchasing agent and the recommendations of the instructor are not followed. This is unfortunate and costly. Inadequate tools that are not adapted to the curriculum are a waste of money. Can an instructor justify spending $10,000 – $12,000 for a hydraulic test bench or $1,200 for a dyno for proving theory? A more practical approach is to develop your curriculum, then plan your tools and adapt it to the facilities. A student will show more interest if he sees hydraulics applied to a familiar object such as cutaway hydraulic brakes.

What does the future hold for power in high school? We see it as a needed course for all, as an exploratory course in junior high and early high school and as a vocational course in 11th and 12th grade. We also see it as a theory and practical course involving testing, repair, servicing, manufacturing and merchandising of power components. What is wrong with using the car, outboard, power saw or lawn mower, etc., as teaching aids? Teachers at times tend to avoid this. They want the student to know the theory of all power sources rather than a combination of practical problem-solving and theory. Adults have difficulty understanding the more complex forms of power, yet we want high school students to know and understand all forms of power. Few students are capable of this.

Developing a power course involves both time and hard work. There are many courses written about power today. These may be followed as a guideline in developing a course in power that fits the student's needs and the community's needs. The course will not develop itself but must involve several people and have a willing and capable instructor.

Mr. Grossnicklaus teaches at Philomath (Oregon) Junior-Senior High School.

Creating student interest—fluid power and automotives

Angus J. MacDonald

Student interest is one of the paramount conditions for effective learning. The disinterested student has become the rule rather than the exception in many programs. Instead of taking a course in order to glean some knowledge about a subject, he merely takes up space. His disinterest or lack of motivation does not stem from a single factor, but usually from a myriad of interacting elements of society, personality, anxieties, aspirations, and so on. Much educational time is being spent in developing an "atmosphere for learning" by mitigating the detrimental effects of the aforementioned elements, but little can really be done by education to eliminate them completely. Stemming from the aforementioned general student disinterest is student disinterest in particular aspects of a specific subject. In the case of automotives, many students enter the program with the predisposition that "they are going to learn to fix cars." Whenever the instructor seems to them to digress from the subject, they become disinterested, and as the saying goes, "turn him off." In the theoretical case of an automotive instructor telling his students, "Now we will learn fluid power principles in order to better understand the automobile," a good portion of the students who expected to hear about "fixing cars" would "turn him off." They would be putting into play a narrow predetermined limiting of the knowledge which they will accept.

The instructor, on the other hand, knows that an understanding of some basic principles of fluid power would aid in developing a better understanding on the part of the student relative to automotives and many other valuable fields. The problem, then, is a question of how an instructor can teach some basic fluid power principles without incurring the disinterest of his students.

The automobile can be described as a "fluid power" laboratory, for within it are innumerable applications of basic fluid power principles. In fact, it is the opinion of the speaker that a good course in basic fluid power can be taught by utilizing the automobile as a "vehicle of learning." Since student interest in many cases is centered in the automobile, they will be more prone to be receptive to learning some fluid power principles if the instructor directly relates these principles to specific automotive applications.

The question for most automotive instructors at this point is, "What are some basic fluid power principles which can be taught from a systems and component analysis of the automobile?" As stated before, they are many and can be easily pursued.

Without going into specialized automotive or mobile fluid power applications, and utilizing the narrower classification of automotives to refer only to the domestic passenger car, a breakdown of some automotive systems and their components can illustrate basic fluid power principles.

The main automotive systems and components which utilize basic fluid power principles are:

(1) Fuel system
(2) Suspension
(3) Lubrication
(4) Brake
(5) Automatic transmission
(6) Power steering
(7) Cooling system
(8) Air conditioning
(9) Accessory

In order to capitalize on student interest, which may be narrowly channeled by him into accepting only information directly related to automotives, basic fluid power principles and knowledge could be taught from a strictly automotive-applications point of view and be more than adequately covered. Thus, the breadth of knowledge of the disinterested student can be broadened into the fluid power arena through the modern "vehicle of learning," the automobile.

Mr. MacDonald is on the faculty at San Jose (California) State College.

Fluid power–interdisciplinary technology

Richard B. Thomas

The Second World War brought upon us a remarkable technical education boom, but, after careful examination, we see that this educational advancement was somewhat uneven. Some of the technologies were lost in this rapid advancement. Fluid power was one of these.

The fluid power industry today is a multi-billion dollar endeavor, which represents a 1000% growth since the end of WW II. A manufactured product which has not been formed or treated or handled by fluid power at some stage of its production or distribution is rare. Our national defense and aerospace programs depend on applications of fluid power.

In a paper presented to the Fluid Power Institute at Wayne State University, Mr. Theodore Pearce, Executive Vice-president of the National Fluid Power Association, summarized these truly amazing advancements by stating the following:

"Thirty years ago an automatic door in a supermarket was a rarity. Today practically every supermarket has automatically-operated doors.

"Thirty years ago automated machines were crude compared to today's numerically-controlled machines. 90% of all automated machines depend on fluid power for the heart and muscles of the automated system.

"Thirty years ago power brakes and power steering were luxury items available only on a few custom-built cars. Today it is almost a case of having to order a car specially if you don't want them.

"Thirty years ago the hydrostatics transmission was known in theory. Today, thousands are in use on industrial and earth-moving machines, heavy off-the-road vehicles, and industrial materials-handling devices."

Approximately 75% of all manufacturing plants in the US use fluid power systems as part of the equipment used to manufacture their products, and 60% of all industrial products produced in the United States have a fluid power system or components built into them.

If the above information is true, and I can assure you it is, if you are involved in industrial education, and you probably are or you wouldn't be here; then it stands to reason that you should have some form of fluid power education in your school program!

Where does fluid power fit into the general series of industrial arts courses?

It won't fit in a drafting lab. In drafting we are interested in lettering, projections, technical illustration and architecture.

It won't fit into an electronics program. In electronics we are concerned with related theory, building radios, repairing television sets and working with simple computer circuits.

It won't work into a graphic arts program. In graphic arts we are interested in reproducing the printed word.

It won't fit into an automotive program. In auto we are interested in the service adjustment and repair of the various units of the automotive mechanism.

How about woodshop? It certainly won't fit there. How can fluid power help saw a board or make a cabinet?

With 75% of all manufacturing plants using fluid power systems, the machine shop seems like a natural place for fluid power instruction. But what is our concern in the machine lab? Turning tapers and threads and making parts.

If you generally agree with the above statements, then it is to you that I will direct the following comments.

At California State College at Los Angeles we feel that fluid power education cuts across all common areas of industrial arts.

Someone must take the engineer's ideas and rough sketches and put them into understandable form. The fluid power industry has international drafting standards. This "language" should be taught in existing drafting classes. There is increasing demand for fluid power draftsmen.

There is a distinct parallel between electrical and fluid power systems. The components of each have similar functions. In the electrical system some kind of power turns a generator. Current is then directed through wires in the circuit by relays, switches, transistors, etc., where flow is controlled. In the fluid power system some prime mover turns a pump. Fluid is then directed through tubing in the circuit by various types of valves which control flow. In both systems energy is transformed into mechanical energy to produce rotary or linear motion. Even the terms used are analogous: pressure-volts, flow-current, restriction resistance.

Scott's Electronic Fluid Simulator training device is 100% electronic, but it simulates fluid flow in various fluid power circuits.

Today's modern printing presses are operating at increasing speeds with maximum accuracy. Fluid power variable speed drives and controls make it possible. There is a linotype machine where the type is automatically and accurately positioned by the touch of a finger. Magazines are automatically raised or lowered or featured for easy removal.

After having training in fluid power, students find that the complex hydraulic system of an automatic transmission can be more easily understood.

The heavy equipment industry is in dire need of trained personnel in hydraulics. Information gained in a fluid power course can be a great asset to a student entering this field.

The study of fluid power can be of benefit to the student involved in a power mechanics class. Fuel flow and air intake rates are being taken on differential pressure indicators.

With most industries' machines having some kind of fluid power actuation, it is imperative that today's machinist have a fluid power background in order to better understand how his equipment operates. For example, there is now a milling machine which has a hydraulic tracing unit attached. The action of the tracing head assembly can be duplicated in the fluid power lab using a similar power unit and components, so the mystery of its operation can be unveiled and understood.

The fluid power trainer is used to duplicate, for instructional purposes, all of the operations of the tracer unit. Even the same master tracing block is used.

Fluid power lab sessions are meaningful and interesting. Students designing an automated drill press have been able to vary the feed speeds, number of cycles per minute, drilling pressures and have synchronized the clamping and drilling operation.

Why not have a machine design class? This kind of class would involve many related studies. Drafting, machine shop welding, casting, electronics, metallurgy and certainly fluid power.

Not only does fluid power cut across the industrial arts subjects, but also it is deeply involved with industries such as: Agriculture, aviation, construction, chemical, aerospace, defense, lumber, materials handling, marine, mining, packaging, paper, petroleum, plastics, railroading, rubber, steel, textiles, food processing and many more.

I hope you have been able to see in this short presentation why fluid power is truly an interdisciplinary technology and why it should be included in every school's industrial arts program.

Mr. Thomas is an instructor in the Vocational Technical Department, Rio Hondo Junior College, Whittier, California.

The educational salad called "reconstituted wood"

[illegible]

woods

The educational salad called "reconstituted wood"

Clayborn J. Anders

If we wanted to make a "wood products salad" and tossed in the following ingredients, what would we have? Insulation boards, fibreboard, particle board, laminated paperboards, composition board, hardboard, "masonite," "celotex," "insulite," "nuwood," beaver-board, flakeboard, chipboard, chipcore, shavings board, "novaply," "cedawood," and "duraflake." We would have a mixture of materials and products of one of man's highest levels of achievement in wood technology.

With such a recipe, using these ingredients, is there any reason to doubt why confusion might exist among our students and members of our own profession concerning this multitude of terms? As we know, they represent various wood-related materials used by industry and some utilized by us in the classroom. Let's take this hodgepodge salad, dissect its parts and rebuild it into more palatable types we can all enjoy, and, if we are asked about its ingredients, we can explain them with understanding.

These panel materials are basically reconstituted wood, in that the wood is first reduced to small fractions and then rearranged by combining into special forms of panels being relatively large in size and moderate in thickness.

If we as teachers have the responsibility of interpreting industry and its products to our students, how can one of the fastest-growing segments of the wood industry be ignored or only given lip service? Our timber resources can no longer tolerate the wasteful cutting practices of the past. In the butcher trade it has long been said the only thing wasted when slaughtering a hog is the squeal; in lumbering we are rapidly approaching full utilization of the tree, less the crash as it is toppled by the sawyer. More and more the entire tree is being utilized. We are approaching the time when the term "waste product" will be eliminated. Industries utilizing reconstituted wood are in the forefront to make use of the entire tree and engineer an extremely versatile and useful product.

Man and his technology can take wood from the tree and in many ways improve its properties by separating its fibers and reconstituting them into new products. Can some sort of classification be made of these wood composition boards for their better understanding?

These products can be broadly classified according to the particle type and the variation in the resin content. Fiberboard, which we know as insulation board and hardboard, and particleboard are the two broad classifications, though the two appear to be coming closer together. The insulation and hardboard materials are fabricated by converting wood substance essentially to fibers and then interfelting them again into the panel material with trade names like "Celotex," "Insulate," "Nuwood," and "Masonite." Particleboard, with trade names like "Cedawood," "Novaply," and "Duraflake," is manufactured by strictly mechanical means of cutting or breaking wood into small discrete particles. They are bonded with synthetic resin adhesives or other binders which contribute to the bonding of the wood particles under heat and pressure.

What recipe shall we use for one of our top wood technology salads called wood base, fiber panel materials? Let us give our salad a little variation in dressing which lends the diversification that building insulation board and the ever-popular hardboard have provided for builders of all types.

These products date from the 1920's, when there were two small plants compared to twenty-six plants in 1968 with tremendous production capacities. Building fiberboards are made of fiber-like components of wood interfelted together when reconstituted and are characterized by a bond produced by that interfelting. At various densities under the controlled conditions of hot-pressing, rebonding of the lignin effects a further bond in the produced panel. If such qualities as increased strength, or fire, moisture or decay resistance are needed, binding agents and other materials may be needed. These may be rosin, alum, asphalt, paraffin, synthetic and natural resins, preservatives and fire resistant chemicals and drying oils. The major difference between hardboard and insulation board is on a density basis with a specific gravity of 0.5 (about 31 pounds per cubic foot). Insulation board is less than 0.5 and hardboard is over this figure.

Some examples of use of this insulation board are sheathing for walls, insulated roof decking, roof insulation, ceiling tile, plank board, shingle backer, formboard and sound deadening board.

Hardboard is an engineered wood product made from clean logs that have been converted to chips and wood fibers. These fibers, when bonded by the natural lignin, give characteristics of density, grainless structure, uniformity in appearance, strength against cracking, checking, chipping and splitting. The hardboards range in densities from medium density boards of 0.5 to 0.8, high density boards of 0.8 to 1.20, to special densified hardboard of 1.35 to 1.45.

The hardboards have variations in surface qualities, such as being tempered and very smooth, to textures like ceramic tile, leather, basket weave, etched and a vinyl coating. Filigree and the ever-present perforated board are extremely popular. These are truly imaginative products and find use in construction, furniture and furnishings, cabinet and store fixture work, appliances and automatic and rolling stock. Whether we serve our lower density salad as insulation board or the medium or high density variety called hardboard, we have a very appealing product.

Particleboards are manufactured from small components of wood that are glued together with a thermosetting synthetic resin or equivalent binder. Particleboard, according to the US Department of Commerce, is the fastest-growing segment of the wood products industry. This is not hard to believe, considering its extensive use as corestock for furniture, paneling, partitions, shelving, sink tops or cabinets. Manufacturers make the material especially appealing by custom-sizing pieces to the consumers' needs. Floor underlayment represents a major use, and the board is finding more use in the residential and commercial building trade. As with hardboard, particleboard in molded, three-dimensional shapes is gaining impetus.

The kinds of flakes used in particleboard range from flour size to an inch or more in length and a few hundredths of an inch in thickness. In most cases thermosetting resins are used like urea-formaldehyde, but it can be phenol or melamine-urea-formaldehyde, depending upon the water or heat resistance needed. The manufacturers of particleboard have made the material so versatile due to the varieties in resins, chip size control, density variations, surface quality, strengths and dimensional stability due to moisture content control. Particle geometry plays a very important part in these qualities and is truly an exacting science. Particleboard also will have different qualities depending upon the type of mat production. The two types are extruded (forced out like toothpaste from a tube) and mat-formed, which uses giant presses and represents the predominate production type. Because of its unlimited uses and its ability to do many jobs better than any present material, the outlook is bright for this imaginative material. Particleboard is another pleasant taste-pleaser from our menu of wood technology salad.

Insulation board, hardboard and particleboard represent but one phase of the excitement being generated in the area of wood technology. Are you and your students sharing in the excitement being generated by these new developments? Get involved with these materials, involve your students, use your imagination. Don't let the new developments pass you by.

Remember the difference between motion and progress. Get your wood technology program in gear and move ahead; make progress. Don't spin your educational wheels at full throttle, thinking you are moving ahead. We hope you can take some direction from this panel and by utilizing some of their vibrant ideas you will find that wood is indeed not dead. The wood developments taking place around us are exciting. Hardboard and particleboard prove this.

You, the educational chef, take the tasty ingredients from wood technology and build up one of the best-tasting and enjoyable salads you have ever served to your students. They will enjoy it to the last chip, as much as you will have enjoyed preparing and serving it with pride and satisfaction.

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Wood is not dead

Rodney H. Scholten

Wood is not dead, unless we as industrial arts instructors hope to kill it. Wood as a material of industry in the United States is still very much alive, as it has been for the past 360 years. Some woods are more decay resistant than others, and, as you know, decay occurs within the material, not outside. I sometimes have the feeling that this decay in programs is the fault of the presenter and not the material. Within our own professional organization we find those that are critical of industrial arts wood programs. Why, I don't know.

Just recently I noticed some statistics with regard to the plastic industry. It has been said that "the wheel that squeaks the loudest gets the oil", and I feel we tend to overlook the true statistics and squeak just to make noise. By the year 1983, according to this report, the use of plastic in the United States will surpass the use of steel. This prediction is based on present trends, and is determined on a volume basis. By 1983 the use of plastic as a material of industry should exceed 7-1/2 billion cubic feet of material annually. This figure should be a bit larger than the volume of steel for the same period of time. Isn't this great? How does it compare to the volume of wood as a material of industry? In 1968, not 1983, our forests produced 18 billion cubic feet of lumber or wood material. Five billion of this amount was lost to fire, insects and disease, which should be a major concern of all of us, but 13 billion cubic feet was used as wood and wood-related materials. The 13 billion of today exceeds the plastic industry in 1983. Are wood and woodworking dead?

The forests of today are still one of our nation's greatest assets. It is one natural resource that will continue at the present level of production, and may even rise in the future. It is unique in that most natural resources will be depleted by time, but not the resource of lumber. Today we are harvesting about 182 million acres of forest land, or 28% of our total. This means employment for about 1-1/2 million people in one way or another. The forest products industries is the fifth largest full-time employer in the United States. It results in salaries totaling $9 billion, the raw materials exceed $18 billion annually, and the products of the various industries exceed $39 billion. The industry alone spends $2 billion just on upkeep and expansion. Is wood dead?

Our forests of today, comprising only 9% of the world's total, are producing 1/4 of the world's total lumber, 1/2 its plywood, 2/5 of its pulp and 1/2 its paper. Is wood dead?

Four of five homes built today are of wood construction. The light construction industry of today employs about 3.2 million people, and consumes $22 billion in materials annually during the production of a million homes. This is one area where we could expand our programs. The Master Builders of Iowa were so desperate for help that they have requested that units in house construction be added to present woodworking classes, and last year helped sponsor a workshop at Iowa State University to train industrial arts teachers in the area of home construction.

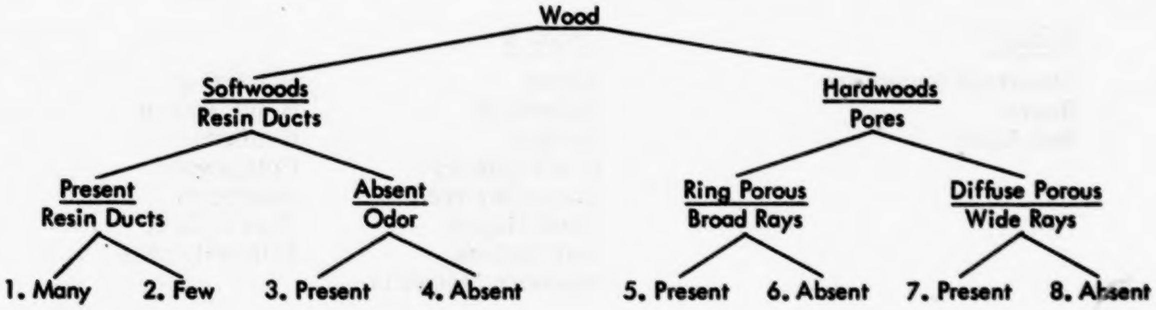
The statistics just given certainly indicate that wood is not dead. To me it seems to be on the move and very much alive, but we must help to keep it that way. What have you done recently to make your wood program a bit more up-to-date, or varied? For a few minutes I would like to introduce you to an area that I'm sure would be of interest to many of your students – macro-identification of wood. This certainly isn't new, but probably is not used in many general wood programs, only technical programs.

We normally divide woods into two categories, hardwoods and softwoods. In the next breath, we use the terms deciduous and conifer, and then bring in two identifying characteristics, broad leaf and needle- or cone-bearing. This is all fine, but have you ever purchased lumber and at the same time been presented with samples of the leaves or cones? No, I doubt very much if you have, and also doubt very much if you purchase the entire tree. How do you then identify lumber? If you have never had doubts about a species, you are one of the few and should be given a medal for your knowledge. I personally have been known to leave a student a bit mixed and uncertain about identification.

Once a tree is cut into lumber, the identification is usually made from the tangential or radial cuts. Color, texture, grain pattern and weight are normally used. I still make use of these characteristics, but a more positive method also includes the cross-sectional area in making identifications. This method of identification was introduced to our group at the Eastern Kentucky University Institute during the summer of 1968 by James P. Pastoret, a faculty member from the School of Forestry, University of Missouri. With his permission, I would like to introduce you to his method of identification.

The separation of hardwoods and softwoods is done by looking for the presence of pores in the cross-sectional area. Only hardwoods have pores, so their absence would indicate that you are looking at a softwood. The radial cell alignment is one macro-identification feature that also helps to determine the softwood group. To help us with this process, the Basic Key, as developed by Pastoret, will do much to put our woods into specific groupings.

BASIC KEY



The Basic Key will help us catalog our woods into groups, which is only a beginning. In working with the key, we cut the cross-sectional area of our unknown wood with a sharp knife, study this small area with a hand lens (10X) and then consider some of the following attributes.

Attribute	Softwoods	Hardwoods
1. Ring Pattern	a. Abrupt Transition b. Gradual Transition	a. Ring porous b. Diffuse porous
2. Odor	Present in some	Infrequent
3. Rays	Narrow	Variable
4. Resin Ducts	Present in Pine, Douglas Fir, Spruce & Larch	Absent
5. Cell Types	Tracheid	a. Pores b. Fibers
6. Alignment of Cells	Radial	Random

Wood Classification by Groups

Group 1	Group 2
Lodgepole Pine	Douglas Fir
Ponderosa Pine	Englemann Spruce
Sitka Spruce	Larch, Eastern
Southern Pine	Larch, Western
Sugar Pine	Red Spruce
White Pine, Northern	White Spruce
White Pine, Western	

Group 3

Alaskan Yellow-Cedar
Bald cypress
California Incense-Cedar
Eastern Red-Cedar
Port Oxford White-Cedar
Western Red-Cedar

Group 4

California Red Fir
Eastern Balsam Fir
Noble Fir
Redwood
Western Balsam Fir
Eastern Hemlock
Western Hemlock

Group 5

Red Oak Group
White Oak Group

Group 6

American Chestnut
American Elm
Aspen
Black Cherry
Black Locust
Black Walnut
Butternut
Cottonwood
Green Ash
Hackberry
Pecan Hickories
Red Elm
True Hickories
White Ash
Willow

Group 7

American Sycamore
Beech
Red Alder

Group 8

Aspen
Basswood
Birches
Black Cherry
Cucumber tree
Hard Maples
Soft Maples
Southern Magnolia
Black Gum
Black Walnut
Butternut
Cottonwood
Sweetgum
Tupelo Gum
Yellow-Poplar

If this method of wood identification is of interest to you, I would like to suggest a few materials that will assist you in macro-identification: Wood Handbook (1955), US Department of Agriculture Handbook No. 72; Woodworking Factbook, Donald Coleman, Robert Speller & Sons; Wood as Raw Material, George Tsoumis, Pergamon Press; Properties and Identification of Wood, James Pastoret, University of Missouri.

Wood is not dead, but very much alive. Let's keep it that way.

Mr. Scholten is on the faculty of Westmar College, Le Mars, Iowa.

Bending and laminating

Ray Turley

As I begin this presentation, may I refer you to the 1968 AIAA convention report, first to Mr. Austin Eckerline's report on page 99, as he gave us as industrial arts teachers 15 priorities for upgrading and enhancing our woodworking teaching abilities and, second, to Mr. Alva Jared's report on page 164, as he gave us five phases of activity that he felt were important to the successful teaching of industrial arts.

As teachers and educators we should sometime soon take the hint and do some upgrading. With the continued stress upon the woods area, it is quite evident that there must be some in the field who are not taking heed of the warnings and keeping up with the trends in wood technology and industry by making their programs meet the needs of the students by providing them with the worthwhile experiences that are found in industry. As the various programs throughout the nation have been evaluated, it is apparent that many of them are still using the "project" as the end result and not as a means to the end. May I ask a thought-provoking question? With a degree in industrial arts, just what are our graduates qualified to do as they go out job-seeking?

The laminating and bending of timbers is an old art and one in which there is quite a bit of interest generated in the classroom. The big disadvantage is the fact that we do not have the facilities to lay up a large timber, but this should not eliminate the possibilities of the mini-jigs that could be constructed and the product used in other projects. Let's not overlook the field trip. That is always a good moment for teaching.

Laminated timbers are important to industry as they are used more and more extensively throughout the world. Their superior strength as compared to the same weight as steel, the aesthetic qualities with the modern laminating shapes, and the superior qualities they possess in burning buildings makes these laminated timbers an important part of the woodworking programs of our schools.

By making veneers out of the trees, the furniture makers have actually been able to stretch the logs and make much more valuable materials out of them. Another important aspect of the veneer industry is the fact that the plywoods are more stable than solid lumber of the same dimension.

The bending of woods becomes quite easy, as they are plasticized properly either with heat or with a chemical that will mix with the lignin or the cellulose of the wood and will allow it to be bent. The best use of water in bending is that it can be a vehicle for transfering heat throughout the wood in the form of steam. Thin veneers may be bent without the use of heat and then laminated to provide the necessary-sized piece of material for the project being constructed.

The biggest obstacle to overcome in the bending of lumber is the stress placed upon it by tension. This is the stretching of the lumber on the convex side of the piece of lumber as it is bent. It is possible to compress lumber and not hurt it appreciably, but it is nearly impossible to stretch it. To bend solid material and keep it from tearing, one must merely build a strap and put end blocks on it that will allow the material to set between them. By placing this set-up in a jig and fixture, pressure can be applied and the material bent without any damage to the cellulose structure of the lumber and without weakening the material any.

For bending thin narrow strips of lumber, a young fellow from the hills of Kentucky soaks the material for about 20 minutes and then forms it by hand over a short piece of 4-inch-diameter aluminum pipe that has been heated with a small propane torch.

The lumber can be submerged in boiling water from 30 minutes to an hour and then bent in a jig and held in place with a couple of strips of wood nailed to the edges of the material until it cools and dries.

Old water tanks can be converted and given a source of heat and provide steam for bending wood. You may want to use a large-diameter pipe with one end plugged and build a fire under one end to provide the heat for the water to give you the necessary steam to bend the material. A word of caution, though: Be careful where you build the fire. These concrete floors will get hot and explode if you decide to build your fire in the middle of the room using the wood scraps out of your bin for your kindling materials. There are any number of molds that can be constructed and used to provide the heat and also a method of supplying pressure to bend and hold the wood that is to be bent and laminated in place until set.

As you cut solid wood jigs that are of any width at all, be careful that your band saw is sharp and in good adjustment or you will get molds that are out of square and will not provide a good flat surface for your material, and the end result will be drastic with a wasted amount of time and effort expended. We say that we don't have the time to make a good mold, but do we have the time to re-do it?

Some woods can be bent by sawing kerfs in it along the back-side of the bend. This is not a bad process where the strength of the material is not important or where the beauty of the project will not be marred. This is the least desirable method of bending material, because of the two reasons just mentioned.

There have been some recent experiments with anhydrous-ammonia-bending, both with the liquid method and the gas method. Wood used in these processes can be either kiln-dried or air-dried material; whereas, the wood used in the steam-bending processes works better if it is air-dried, as there is still moisture in the material that will allow the steam to carry better and more completely.

These processes have provided us with a method of bending a single piece of material into many complex curves that cannot be accomplished with steam. Information on these processes can be obtained by writing to the Forest Products Laboratory and asking for the information.

Make sure that you follow the safety precautions that are given for the use of ammonia under pressure and also in the liquid state with the temperature -40°F. Gas masks (field protective masks for you who are militarily-minded) and rubber gloves are two of the essentials in the safety of the use of this product, as is a well-ventilated or hooded room. If the hooded room is not available, then the experiments must be conducted out-of-doors, and at all times, either place, they must be performed under constant supervision. When one can take a single piece of lumber and tie a knot in it or shape it into a bowl, then we can say that the wood is well-plasticized.

It would be this author's wish that all the instructors in the area of woods would take a good look at the programs they are teaching and make adjustments in methods and in the curriculum to provide the student with an interesting method of learning, first-hand, the processes of industry so that he may be able to graduate and go into industry as a well-qualified and knowledgeable person in his own area of learning. Until we can do this, we will always have to "defend" our programs.

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other action

A general educational happening

Donald P. Lauda
Robert D. Ryan

One foot in the present and one foot in the future – that seems to be the problem of modern man. This quandary leaves him one of the confused citizens who perpetuates a society of ignorance and in many cases a society of turmoil. This can be illustrated by quoting an Iowa farmer who once said, "I don't mind progress but I sure hate change."

The reasons for rejecting change are myriad. The human is bound by traditions, mores, stereotypes and attitudes, and it is these psychological blinders that prevent attempts at facing reality. One psychologist estimates that in this decade people over the age of thirty cannot accept change without experiencing serious frustration. It is no wonder we hear so much about the younger generation.

The logical place to discuss modern technology and its effects is in the elementary and secondary school, but research indicates that this is not being done. Our contemporary educational system is producing technological illiterates. The writer is not referring to people lacking skills alone, or failing to realize how a single industry is structured, but to a lack of knowledge about change. This lack causes some people to react by choosing change for the sake of change. This we must accomplish through a rational approach in our educational system. At St. Cloud State College we are picking up the pieces at the undergraduate and graduate level by teaching about change and its consequences. Since so many concepts are approached in such a course, time and space will permit only a few to be discussed.

You may say that this is not new, that industrial arts has been overwhelmed with the "industry" approach. However, a close analysis will reveal a new and fresh approach that involves boys and girls and which is as contemporary as change itself. Teaching an understanding of change isn't difficult. Students enjoy it, and the industrial arts curriculum is the logical place to instigate such a program.

Students, parents, teachers – all people must develop a conscious awareness of what man has created and is creating if they are to live in the latter part of this century and the 21st century with any sense of mental security and dignity. A short time ago, the year 1975 was the era to look forward to, but let me remind you that technologically we have passed that year, and, to be kosher, we had better start living in the era the writer calls "Walter Cronkitism." The future is here. It has come up so fast that little do we realize that 25 percent of all the people who ever lived are alive today, that 90 percent of all the scientists who ever lived are alive today, that the amount of technical information doubles every ten years, that while you walk about this convention today, the computer will process some data affecting your life twelve times. Yet most people live with the assumption that our society is relatively static; thus the term "culture shock." It is time that we developed some cultural reality.

The year 2001 may seem far off to you, but we must remember that our elementary students are right this minute being prepared for a productive life in those years. A child in grade one today can expect to live through twenty-eight productive wage-earning years in the 21st century. However, lest we forget change, keep in mind that this is assuming that our society remains static. We must be realistic and ask ourselves if man will work in the 21st century. Will the guaranteed income be a reality and, if so, with what results? Or will man even exist in that century? Yet we insist on flooding the market with technological idiots. It is time we became concerned.

Two facts are paramount today that most people fail to realize. Number one, the problems of today are no longer technological; rather they are economic, sociological and political. It is estimated that two percent of the United States' population could produce all the goods and services needed by that country. Number two, the employed person in the 21st century will be the professional, the doctor, the engineer and the scientist. We laugh at such data as we think back about our broken television set and other technological freaks we see every day. But, as we do this, we should remember that we are actually doing that which we want to erase, that is, taking technology too lightly. Such behavior leaves us exhibiting our own technological illiteracy and resistance to change.

Role of the computer. The basic concepts of the computer were conceived by Charles

Babbage in about 1812. He was a professor of mathematics at Trinity College, Cambridge, England. He designed a machine to accomplish basic arithmetic computations which he called a difference engine, and later designed, but never built, an analytical engine. Although this machine was never built, its design included the basic principles which were the foundation of our computers of today.

About 1844, George Boole devised a form of algebra which was performed on the basis of yes-no principles. From Boolean algebra came the concept of binary mathematics which uses only 0 and 1 for numerical presentation.

It was not until the early part of the Second World War that work on the digital computer began. The military required ballistic charts for weapons. The calculations were too long to be done by hand. The first machine was designed and built by Mauchley and Eckert and was operational by the fall of 1945. ENIAC—the grandfather of computers—was born. Today's computers are no more similar to ENIAC than a jetliner is to the Wright brothers' plane at Kitty Hawk.

The applications of computers to industry, business, education and society are endless. In order to stimulate some interest and awareness, just a few examples will be presented.

Transportation. The glut of vehicles on our highways and byways is reaching the point where conventional modes of travel are becoming prohibitive. Actions are being taken to correct this. For example, in the near future it is possible that your automobile will contain an on-board computer. You will stop at a toll booth and indicate you wish to travel to Los Angeles. The card will be inserted into the computer, which will determine the route, speed and lane your vehicle will travel. This will be accomplished by wires imbedded in the roadway, tied to a central computer for this controlled travel condition.

Computer-assisted learning. Today there are endless experiments being conducted into computer-assisted learning. It would appear that in the near future students will spend probably one or two days at the most in a formal classroom. The remaining school week will be spent at home with a computer-controlled wet carrel. This carrel will contain a CRT with light pen, dial-access, video-tape capabilities, electronic chalkboard and other exotic devices. The student will progress at his own rate and into areas of his own interest, along with the traditional essentials.

Postal system. Today the United States' postal system is handling untold millions of pieces of mail, and the amounts are increasing at an alarming rate. Americans function on paper – mail, memos, etc. As a result, the postal department is gearing up for computerized handling of mail, the main piece of hardware being an optical scanner. For quite some time ZIP codes have been semi-required. Very soon it will be required. A computer manufacturer has now developed an optical scanner which can read 360 fonts and block hand printing. This coupled with mechanized, automated, computer-controlled hardware will process the bulk of the mail in the very near future.

Automated industrial operations. There is no question that automation will increase and, as it does, potentially the United States will experience increasing amounts of unemployment. It appears that if an individual's job does not contain some element of creativity or subjective analysis, his job faces elimination by a computer.

Space. There is no question that if it were not for the computer – its speed, accuracy and capabilities – our space accomplishments could not have been possible.

Examples could be cited in an endless array; however, there is another aspect to this entire area.

Will the computer outwit man? There are those today who fear the computer. They fear that it will take over human responsibilities and relegate man to a humiliating and inferior role.

Ever since the beginning of mechanical time, man has been haunted by the notion that man-made devices might overwhelm and even destroy him – the sorcerer's apprentice, for example, who almost drowned his world; Frankenstein's frustrated monster, who tortured and destroyed his creator; and now we have the androids that mimic human beings from the frenzied pages of science fiction. These all relay the fear that man's arrogant mind will someday overleap itself. Today it is the electronic computer. This is the first invention to exhibit something of what we human beings might call intelligence.

However, at this time, and let me emphasize at this time, the electronic computer is a device that processes or improves data according to a program or set of instructions. The programmer cannot make a computer do anything original until he has painstakingly instructed it how to be original. Thus, its performance depends entirely upon the intelligence of its perceptor. What we are saying is that a computer is only capable of following instructions. The computer cannot do anything that the programmer cannot do.

Therefore, we can simply state that the computer can only save time. The limitations of the computer are not in the machine but in man. As the great originator, man will necessarily remain on top.

The task ahead, and this is a fear of many, will be to assign to the computer those things which it can do best and reserve for man those things which he must provide and control.

Work has always been considered in the United States to be an activity that is healthy and respectable. Traditionally, then, we have a work culture and when we don't work we are considered lazy and worthless – in other words, contrary to the Puritan work ethic ingrained in each of us. The time is rapidly approaching, however, when work must be redefined. It has been stated that two percent of the population could produce all goods and services needed by the people. Where does this leave the rest of the people? As we consider work to have a high priority in our lives, maybe we should ask ourselves, isn't the entire concept merely a custom? What is so hallowed about an eight-hour day? What would be wrong with a society based on leisure?

If a person must work, whether it be for financial reasons or for mental well-being, he must work and enjoy it. The ultimate goal of American industry should be employee satisfaction as well as reasonable profit. However, this is not always the case, in spite of union demands. Speaking of unions, you might be interested to note that they have even negotiated for loneliness pay, since the worker is becoming so far removed from his peers and product produced. Stipends are not the sole solution, since man does not work for economic wants alone but needs to identify and needs self-identity. We can ask ourselves, does modern technology take away all identity? Usually the answer is yes. However, one must place such a discussion in the proper perspective. If comparing 1969 to the 1800's, man probably has as much as ever, both mentally and economically; however, when discussing the future, the crucial issue is, can man adjust to the machine, or should man take away a job from the machine? As long as the Puritan work ethic is ingrained in each worker, the question of who works – man or machine – will be paramount.

In our society the unemployment rate is looked at with great discontent even though the Council of Economic Advisors states that an unemployment rate of four percent is reasonable and prudent. The writer takes the view that a much larger figure, say around 10 percent, would be reasonable and prudent. Let me remind you that we will soon be facing figures of 50-98 percent within fifty to one hundred years. We might not call it unemployment at that time, but the concept of free time will still be present and must be handled properly. Let's look at that unemployment rate for a moment. Most people feel moonlighting causes the high rate. With 11 percent of the working people moonlighting, it seems plausible that we should take these jobs and give them to the unemployed. But this is not realistic, since the average unemployed person could not handle the technical skills required in the moonlighting structure. The average moonlighter already earns $7,500-$10,000 on his first job, and this amount indicates his skill level. It is unfortunate that it is the Negro who is caught in the middle. The unemployment rate is twice as high for the non-white, and even the unions reject the non-white. There are over 200 Negro unions in the United States due to segregation and also more Negro Ph.D.'s than plumbers or electricians.

Young people must be made to realize a number of factors, two of which will be mentioned briefly. One, mobility is a prerequisite for employment in the 1960's. If persons are willing to move, they can find work in most cases, but again people are bound by family ties and economic considerations among others. Number two, the importance of education must be stressed. The stigma attached to vocational education must be removed as well as much of the stigma attached to industrial arts or pre-vocational education.

In the latter part of the 20th century, man is caught up in the squeeze of competition – competition for jobs, education, social contact and self-identity. The pressures brought on by technology in too many cases are not satisfied by leisure as they once were. We feel the computer controls our lives, when actually the inevitable controlling factor is the clock. If a person from "clockless planet" were to visit earth today, he would literally be appalled by the little device we call the clock. Rush, rush, compete, work, live – but all within the bounds of the clock. Yes, man today, as Sebastian deGrazia put it, has tranquilizers but little tranquility. Man goes through life bound by the clock and works for thirty to fifty years, punches in at 7:00 and out at 4:00. And what do we give him at his retirement ceremony? You're right, the golden watch. What an irony.

There was a time once when man had leisure and knew how to cope with it. There is also a time rapidly approaching when man will have free time and possibly leisure time, but will he be able to cope with it? Remember two facts. Number one: There is little sociological study on the topic of leisure, and this must be accrued quickly. Number two: The United States' educational system does not make a conscious effort to prepare people for a life of leisure.

Well, what are the solutions? Maybe we need to take another look at types of leisure. The stockbrokers are quick to realize that the leisure market is one of the best buys today. It has reached a 150-billion-dollar market, fifteen times that of medical care in the United States. In the United States we spend about $500 million on cars, boats and airplanes per year.... cars that don't run, boats that don't float and airplanes that don't fly. Yes, models have taken on a whole new perspective. It appears that certain parts of the curriculum need to investigate the needs of the future. These areas probably should be art, music, physical education and industrial arts. In fact, there is not an area that cannot contribute to the leisure concept if a conscious concerted effort is made.

Time does not permit a discussion of the retirement years, but if people cannot cope with leisure while they are young, how can we mold them when they are old? Plants that have shortened the work day have frustrated the older worker to no end. "What do I do with this free time?", they ask. And as you might expect, when forced retirement comes, who can afford it?

Yes, the problems are there today and very real to all of us. It is easy to put the ball into the laps of the educators, but maybe that is where it should be placed when we discuss work and leisure. An awareness is a start.

The question then really is, how can we teachers, who are products of our time, molded by the existing institutions, values and attitudes, help those who are victims of a new society?

The phenomenon of working women, especially married women, is relatively new to the American labor force. Rather than bore you with statistics, the author will state that about one-third of the labor force are women and that two-thirds of all married women work. It is also a fact that 95 percent of all the girls in our public schools today will work at one time or another.

Educators, and especially those in secondary schools, must have the women face reality and be aware of the opportunities and responsibilities they have as potential workers in our industrial society.

It is more important to dwell for a short time on why women work, especially married women, rather than statistics. It is recognized that single women, and women heads of households, must work; therefore, consideration will be given to married women.

Historically, women have worked only because of financial needs. However, during recent decades, the rise of employment of women has led to extensive research into why.

Women's statements on why they work must be interpreted with extreme caution because in many cases the overt statement is only a concealing reason to cover up a perceived feeling for working. This overt statement is given because in their own minds they may tend to feel that their place is in the home, the attitude which has prevailed in American society until recent times.

When asked why they work, most women will very quickly state that they work because of financial needs. It must be obvious that women vary widely in their perceived financial needs – better education for their children, larger or more elegant homes, second cars and many other items of status. Although the significance of financial motivation cannot be minimized, there are other motives to cause women to enter the labor force.

Spending before earning. Charge accounts and easy-pay plans have in many cases made a second wage-earner in the family a necessity. American advertising, which has created a desire for many of the material goods and so-called status symbols, is causing the American family to purchase before earning. As a result, many family units must acquire another wage-earner, and the most likely candidate is mother.

Changing attitude of the American public. Not too many years ago it was not acceptable for a man's wife to work. The traditional attitude was that when a woman married she accepted the role of motherhood and homemaker. Today this attitude has taken a 180-degree turn. For example, in the young married couple the wife is expected to work, to earn money for the down payment on a home or other necessities to get the couple off and running. However, this many times leads to continued work for the wife. They soon adjust to the two incomes, and the thought of existing on one income sends fear through their minds, or, and probably the truth, they have time-payments which cannot be met on one paycheck.

Increasing education. Recent years have witnessed an increased number of women attending institutions of higher education to prepare themselves for a variety of occupations. Upon completion of their training they seek work. This training and work experience give the woman a feeling that her time is worth money and should not be spent at home. They wish to contribute to our society and to find greater self-fulfillment through achievement and success in their job.

Lack of social contact. Over and over it is stated that women must get out of the home to talk with adults. The husband is constantly being faced with the argument that he is out at the office every day and converses with adults and has intellectual stimulus; whereas the wife stays home and talks only with children, except for an occasional coffee klatch.

Birth control. Birth control has allowed for family planning. The result has been smaller families and longer work-life for the American mother.

Industry wants women workers. Business and industry are encouraging women to enter the labor force. They are being asked for various reasons – relatively cheap labor, dexterity (they have nimble fingers), patience, low boredom threshold – they tend to be more content and not strive for advancements.

Bored with homemaking. Many women today do not find a challenge or feel rewarded from being only a housewife. They, in many cases, quickly become bored with washing, ironing, dishes, preparing meals and other daily routine chores of housework. Technological advances have made the chores of housework much easier, and, as a result, women generally have increased free time at their disposal.

It is apparent that women work for a variety of reasons and possibly more than have been presented. However, it is certain that more and more women will be entering the labor force and will be working for a longer period of their work life.

There are many topics that can be discussed in a course such as is offered at St. Cloud State College, but one of the most popular among the students is population and the food shortage. There are two basic problems facing the world today, over-population and the food shortage. If you have ever watched a computer tally the world's population, it is quite shocking with a baby being born every time your watch ticks once. Since the year 1946, the earth's population has increased two percent annually. This geometrical progression will be the real force behind the change in the future. Today we see movies based on this concept, such as "Shoes of the Fisherman". "Who will feed all of these people, or where will we put them?", we ask. If the world's population continues to grow at the present rate, we will have one person per square foot of land in 200 years.

Basically, what has happened with the world's population is that we invented death control before birth control. For example, in Ceylon, DDT in ten years reduced the death rate 57 percent. By 1986 some cities in India may have populations of 36 million people. We must realize that the United States may have only three large cities in the year 2000, but 36 million people is beyond comprehension. Russia takes the position that mass cities are detrimental, and maybe we could learn a little from their approach.

People resist change, of course, due to many reasons, and population control brings out our most latent stiflers of creativity and rational thought. Technologically, it is possible to solve the two problems in question. Man has created pills, among other tangible items, that can stop the birth rate. Historian Arnold Toynbee gets to the heart of the problem when he says, "The issue is indeed a religious one in the sense that it raises the question, 'What is the true end of Man? Is it to populate the Earth with the maximum number of human beings...or is it to enable human beings to lead the best kind of life that the spiritual limitations of human nature allow?'"

These questions must be answered and answered now. Even if we had worldwide co-operation in research and development at this very moment, April 10, 1969, it would be too late to prevent a drastic rise in the death rate through starvation. Two thousand years ago Greek philosophers asked, "Who should be allowed to breed, with whom and how fast? The educated classes? The physically healthy? Is it right to ask if one genetic strain is better than another?" Already the United States' population at 200 million is estimated to be over-populated by 50 million for optimum living.

Population explosions come in cycles, and, although the United States has witnessed a dip in its birthrate, it is doubtful that it will continue. The World War II baby girls are now getting married and having babies which will cause another wave in the 1970's. Do we have an obligation to educate these people about population problems and what can be done about them?

We can sit in our sterile hallowed society handcuffed by out-dated beliefs, customs and norms, completely disregarding birth control as a logical means to solve the population problem. Yes, we find it too easy to turn our backs on logical technological innovations that can help. And with our unique ability to conjure up double standards, we find it easy to turn our back on the two-thirds of the world's population that goes to bed every night starving or suffering from malnutrition. Today people barter for rats for food in Biafra. Can any person look into a mirror and say this is the logical approach to international stability?

One of the basic problems with a lack of food is that people get enough calories but little or no protein. The result is kwashiorkir, a disease which results in the enlarged stomach, protruding ribs and eventually a deterioration in the mental capacity. If the afflicted child should live he probably will have a very low mentality and will then perpetuate ignorance the rest of his life.

And not for one minute should we associate starvation strictly with Asia or South America. These countries will probably reach a famine of serious proportions by the year 1980, but in the United States alone we will have to increase beef production 45 percent by 1983 just to maintain our present diet, poultry 50 percent and vegetables 38 percent. Also keep in mind that our country doesn't take any back seat when it comes to children with worms, protein deficiencies, rickets and anemia. "Use our surplus foods," is the solution offered by many. "What surplus?" is the answer given by those who control this supposed surplus. It is estimated that if the world took all of its surplus food and distributed it to the starving, it would amount to two teacups of rice for every person for seventeen days, and then it would be completely used up.

At the same time keep in mind that the concept of death still presents questions, and, as medical science progresses, man has a number of questions to answer. Who should die, when is a person dead and to what extent should we continue life of the diseased? If man ever conquers heart disease and cancer, what will this do to the population problem? The writer is not advocating mercy killing but merely wants to stimulate some thought, and our youth are concerned about these questions today.

What are the solutions to the starving masses? Many have been offered, and technologically-speaking they are all possible. Freedom begins with a full stomach, and hunger begins with a hungry plant. Fertilization in the world must increase seven to ten times just to maintain the present level of production and, as with aid to education, the funds are distributed with an improper proportion. Eighty-five percent of all fertilizer used in the world today goes to the well-fed areas of the world. The remaining 15 percent is too often used improperly due to a lack of education throughout the world. A more adequate use of livestock is another solution. Here again we find the misuse of human endeavors. In some countries disease kills 40 percent of the livestock per year. India maintains under governmental control seventy old cow homes, and 40 percent of the cattle roam without control. Naturally it is a religious factor here, but cannot we change? The preservation of food is another needed event. In India rats eat 20-30 percent of all stored grains; in Africa one-third of the foods are lost to pests.

And how about water? In India inadequate irrigation restricts food production 65 percent; in the world only 11 percent of the cultivated land is irrigated, and only one-third of the world could use irrigation successfully. Research indicates that there is the same amount of water on earth or below the earth as there has ever been. True, it may be polluted, but this, too, could be solved if man applied technology and went beyond the controls of economics and politics. One-half mile below the earth we have 3,000 times more water than there is on the top, and it is unpolluted, ready for our use.

Speaking of water, keep in mind that seven-tenths of the earth's surface is covered by water. In the ocean lies more potential than on the land or in space as we know it today. For example, the fish supply. Grinding up fish, bones and all, produces 80 percent protein. Seaweed produces food of high quality. The sea may some day possess underwater cities or surface cities as advocated by architect Tunge of Japan. Minerals are so abundant in the ocean that they completely dwarf all that which has been mined on the surface in all of the history of mankind. One example is magnesium – one pound per 147 gallons of seawater. If we took 900,000,000 tons per year for a million years, it would have withdrawn 1/100 of one percent of the available magnesium in the ocean.

Technologically the bulging population can be curbed along with the help of our educational system. What is required is a global approach backed by international cooperation in research and development. But whatever technological material is used, history tells us that it can only succeed with a knowledgeable society. When the social history of this decade is written, will it be worth noting that in the winter of 1969, when the world confronted mass population starvation, the people who had abundant food disregarded others as they pushed their food baskets through the supermarket filled with exotic foods debating whether to have a roast, or a steak or maybe a protein-laden instant breakfast?

All around us are striking evidences of the technological success of science - space vehicles, nuclear power, synthetic chemicals, medical advances which assist man to be more useful and extend his life. Yet - look at our environment more closely. We exist in a world of sharp, defined contrasts. One group of scientists and technologists is researching means to supply oxygen to our men who will walk the surface of the moon, and just across the hall is another group trying to learn why man is fouling up the air that he must breathe.

For aeons human beings have survived and proliferated on the earth by fitting unobtrusively into a life-sustaining environment - living in harmony with animals, plants, micro-organisms, soil, water and air in a matrix of mutual relationships.

And now in just a few years, in relation to the history of man, our air is reaching the point where it is unhealthy to breathe, our lakes are becoming cesspools - we are literally destroying the earth with our garbage. The writer does not believe that the greatest threat to our future is from bombs or guided missiles, but from internal sources. Our society will die when we no longer care. Arnold Toynbee has pointed out that nineteen of twenty-one great civilizations have died not from conquest but rather from within. These nations went down slowly, no fanfare, no flag waving - it happened in the quiet, dark apathy of its people.

The world is painfully aware today of the growing antagonism between man and the social environment he has created. Vietnams, racial wars and urban masses bring to the forefront our failure to adapt human settlements to technological and social change. But, the lack of awareness of perhaps an even more sinister situation is apparent - man's relationship to his deteriorating physical and biological environment. This gigantic problem is the most serious long-term situation facing mankind. It derives specifically from our ever-expanding technology, which has provided an ever-more-opulent way of life.

The application of science has done more than any other discipline to free man from the bondage of hunger, fear, ignorance and superstition about the world. However, in utilizing the products of science, we have fooled ourselves with the illusion that we can have something for nothing. We have also been led to believe that science and technology can always find a way. This is no longer true. The rate of change has accelerated to the point where we have to find a substitute for time. We no longer can sit back and allow the changes to be assimilated into our world. If man is to survive, he must become aware of the damaging effects of new technologies and balance them against possible benefits.

There are many areas entering the literature today under the title of pollution - air, water, noise, thermal, soil, conservation and mind, to name a few. Only three will be discussed briefly - air, water and noise.

There is no need to elaborate greatly on air and water pollution. Everyone is aware that countless tons of pollutants are being dumped into the air, water and onto the land. It has been said that if something is not done soon to curb these actions, the earth will be nothing more than one large garbage dump.

However, a new pollutant is entering the awareness of American society. That is noise pollution.

As man's world becomes more mechanized, his life is changed. Often this change is one of improvement and advancement, allowing more leisure time and making his menial tasks easier. Along with this change there may be some unnoticed and unwanted consequences which in reality would potentially be dangerous. One such consequence is noise. Noise has now taken its place alongside air and water pollution as a growing concern. Noise is a complex environmental factor which is a function of both pitch and loudness. This report will only deal with loudness, which is measured in decibels. A decibel is a measure of power or pressure and is a logarithmic ratio. In order to give some idea of what a decibel actually is, a comparison can be made. Standing near the tail of a jetliner with all four engines running, a person's eardrums will receive a thousand trillion times the pressure compared with a minimal sound he can hear against a silent background.

When does noise become dangerous? Most experts agree that sound intensity in the 80- to 90-decibel level causes gradual hearing loss. There is no question that 150 or more decibels will cause blast trauma and instant, permanent hearing loss.

The average home has sounds which are normally in the 60 to 80 decibel range. Power lawn mowers have been measured at 105 decibels and jet engines are around 120 decibels. The 120-decibel level is where noise becomes painful.

One point which is particularly disturbing is the loss of hearing of our youth. Studies have indicated that from 25 to 75 percent of teenagers today experience some degree of hearing deficiency. This is due to one specific cause – the loud music they listen to for long periods of time. The current discotheques have been measured for decibel level, and the majority are in the 100 to 110 range.

Many examples could be given, but in this short time, specifics must be limited. However, unless man becomes aware of this invasion of silence, the level of noise will increase and will cause harm to the human organism.

The obligation which our technological society forces upon all of us, scientists, technologists and citizens alike, is to discover how humanity can survive the new powers which are being discovered and given to us every day. It is presently apparent that our current difficulties, and more importantly, those of the near future, will demand far-reaching social, political and moral actions. For example, the solution of our pollution problems will drastically affect the economic structure of the automobile industry, the power industry, agriculture, sanitation and will require changes in urban organization.

Every major advance in the technological competence of man has enforced revolutionary changes in man and his society. The present age of technology is no exception to this rule of history. We already know the enormous benefits it can bestow, but yet we are finally beginning to perceive its frightful threats.

Science can reveal the depths of this impending crisis, but only social action, your action – yes, you individually, can resolve it. It is our charge to you to tell the story as it is to your students. We have a message to give, and those who do not hear are "disadvantaged" and will not be able to gain the awareness of the situation confronting the world and make the necessary decisions. Remember – this is your world and your problem. Only your judgment can determine whether the knowledge technology has given us shall destroy humanity or advance the welfare of man.

Messrs. Lauda and Ryan are on the faculty at St. Cloud (Minnesota) State College.

The *sine qua non* for social and technical action

Bill Wesley Brown

As I prepare the initial draft of my formal remarks, I look at the calendar. It is 28 February 1969. I am not at my familiar office – in fact, I am a continent away: I am at Cape Kennedy. I have been invited by Dr. Thomas Paine, chief administrator for NASA, to tour the facilities of the Cape, and to witness the launch of Apollo 9. I have secured my credentials, received a briefing on the mission, and have had time to marvel once again at the incredible marriage of science and technology which – it is planned – will enable man to take giant strides toward flying two of our fellows to the lunar surface and then return them with their companion astronaut safely to earth.

Even as the DC-8 routinely landed at Atlanta on the flight from San Francisco, we have known that the mission has been postponed. The prime crew has developed sore throats.

Sweep-second chronometers mark the passing of time with impersonal efficiency. The people in this community must surely be the greatest clock-watchers of all time (no pun intended). From the hucksters who represent crass commercialism to the specialists who represent sophisticated science and technology, time is something to be sold, measured, marked, divided, saved and even cherished.

In spite of worsening weather, both at launch and recovery sites and times, the postponed mission went largely by the book – like the landing of the DC-8, much of the flight seemed routine.

The absolute essentials for success in our space program – men, science and technology – have already been described. It is my belief that the absolute essential for social and technical action has also been described. It is my belief that the absolute essential for action in industrial arts has also been described.

Most of you are now asking yourselves: "Let's see, what did he mention... facilities? If so, what kind... how much... how will they be equipped... what service and utility supplies will they have...how will they be constructed...how will the interior spaces be divided...? As important as facilities may be, it seems obvious that facilities are not an absolute.

"Perhaps he was referring to an invention, or to a cluster of inventions?" Which invention, or cluster of inventions which have become a part of our way of life, would you select as the absolute necessity for progress made in social or technical spheres of influence? I dare say that few of us would agree on a single invention or even a single "cluster of inventions." As important as inventions may be, it seems obvious that inventions are not an absolute.

"Perhaps he was referring to ideas." Such an idea might be a concept that had never been proposed by any person in the thought-consciousness of the human race, or perhaps an idea phrased more perfectly than the imperfect way it had been stated at an earlier time. Perhaps it is an idea that describes in subtle ways a relationship between two or more concepts not previously recognized by man. Perhaps the idea and the relationships are so astounding and revolutionary that the men they affect must take time to assimilate the new relationships into their normal way of living. Sometimes habits become commonplace enough to become institutionalized. When this happens, the institutions will have to change the laws of the land, or the laws of the land will have to change the institutions back to their former patterns. In past times, hundreds of years might well go into the sometimes-subtle changes alluded to. Before we classify ideas as non-essential, let us consider other options.

Perhaps what is required is people, people trained in identifying a problem; prepared to develop an hypothesis concerning probable solutions; able to test the hypothesis under controlled conditions; capable of accepting or rejecting the hypothesis; and able to demonstrate how the new knowledge can be put to work. We have finally identified one absolute essential for social and technical action. Others will become clear in a moment.

One thing appears certain. The time between social idea or concept to near-universal acceptance – the actual change of social behavior and ultimately the institution – is sharply diminishing. It took man thousands of years to develop a social conscience concerning human dignity and worth. Ever since some men agreed to work for others, their value and compensation have been tied to time spent, goods and/or services produced, skill, seniority, preparation, numbers of children or dependents, a danger index and others. Late in the evolutionary pattern we find items called "fringe benefits" – paid vacations, overtime stipulations, insurance, sick leave, hospitalization, educational benefits, retraining, and now, a guaranteed annual wage. For some time we have also been paying certain members of society not to produce: The soil bank for farmers is one example, and some people would argue that welfare payments fall into the same category. Most of these things we now generally take for granted. It is all too easy to forget that most of these things which have been granted by either "enlightened management" or won by "fighting unionists" – depending upon your point of view – were proposed many years ago by sometimes famous and sometimes obscure individuals. With better and more-nearly-universal communications, the time between social idea and social implementation is rapidly decreasing.

We have begun to formulate our sine qua non for social and technical action. It seems clear that people and time are irrevocably involved. It seems reasonable to assume that the minimum number of people involved are two – at least one interacting with another. It also seems clear that time is needed to allow both to profit from the interaction. A primary assumption must be that this interaction represents a new dimension for one of the participants. In its best sense, this is education. If this assumption is valid, we can now proceed to some secondary considerations:

(1) We must assume that each person is capable of rational thought.
(2) We must assume that ideas which will affect both of their actions will flow between them.
(3) We must assume that they are able and willing to implement and act on, as a planned-for entity, a concept they both endorse.

The implications of these assumptions are staggering. Perceptive people with ideas, time to consider the impact of those ideas, and the means to implement the best of their creative thinking represent the absolute essentials in every field of endeavor.

If you want to become engaged in a stimulating discussion with a small group of about ten or twelve, and at the same time prove the points already made, ask them to identify the ten greatest inventions of all time. Then ask them to identify the ten greatest ideas of mankind. Finally, ask them to identify the ten people who have made the greatest contributions to mankind. The group who would seriously try to do these three things must consider, and then include or reject, the entire history of human achievement.

It is now appropriate that you ask: "How can I bring about social and technical action?" My answer to these questions persists: We have identified several major concepts central to human development. The most important is easily the perceptive individual; two others, ideas and inventions, spring from him. The other involves time – time that you the teacher can spend with students, which is very small, or time that your students spend with you, the teacher, which is very large. As a teacher, you have an awesome responsibility to guide others. How well you guide may be the only positive index that some may have concerning "the establishment." Your values will not be the values of others unless others see that it works for you. That is social action.

As a teacher of industrial arts, you have an equally awesome responsibility to guide others in learning how individuals, ideas, inventions and time interact in our industrial society. You may also have an equal responsibility to guide others in learning how people live where individuals, time, ideas and inventions are not important. The answer to "What can I do?" is all too clear – you can do everything, or you can do nothing. You can help chart that which was uncharted, you may discover a new relationship, or invent a device the need for which has not yet been realized, or, more likely, you will guide others so that they will do those things yet to be done. The record is clear. We stand on the shoulders of those who preceded us in order to achieve those things left undone. Only when we see the past in perspective does the future hold promise. We have many people capable of following signs. What we need is more people capable of establishing the signs.

The need for creative leadership in industrial arts remains high. In a profession that is static, that is going nowhere – and in fact is content with past successes – creative leadership is not necessary. In a profession that is seeking to redefine its role within the global aspects of education, however, the need for creative leadership is both urgent and necessary. As questions are defined and solutions devised, the creative leader will see other questions more sharply phrased.

We all have seen industrial arts students taught by creative individuals under incredibly poor conditions – inadequate and obsolete equipment, poor facilities, and a low level of support for materials and supplies. The students storm the doors early in the morning, and are reluctant learners only in that they are reluctant to go home at night. We also have seen the reverse.

One of the concerns with which some have been working for a number of years is the supply of perceptive industrial arts teachers within the profession, but especially within what we now call the inner city. Some might say that the overall problem of the inner city does not affect them. When one major city in California has twenty-five industrial arts vacancies at the junior high level (as of 1 March 1969), it is not difficult to perceive how every professional industrial arts teacher is affected by these numbers of students not being taught.

Every time we have a so-called industrial arts teacher who is going through the motions of teaching industrial arts, our profession is hurt.

Every time we have a so-called industrial arts teacher whose students only "make things" and never learn concepts, our profession is hurt. We no longer produce one-of-a-kind in our industrial society.

Every time we have a so-called industrial arts teacher who does not use texts, outside assignments, library assignments, written evaluations, experiments and research, our profession is hurt.

Many people are now questioning the industrial society which we have created. They are the mill-burners of an earlier age. Young people all over America, though supported by an affluent society, cry out against its impersonal nature. They protest the use of technology to wage war. It is in our industrial arts classes that we can educate each generation of young people concerning their and our industrial society, with all its ramifications, that their parents – and their parents before them – helped create. It is in our industrial arts classes, and in no other, where theory and practice concerning production, investments, inventions, unions, management, profit and loss, skills and knowledge can all be studied.

Apollos 10 and 11 are almost ready to go on their respective missions. In their own way, equally courageous aquanauts go about the business of setting up signposts for others to follow on their way to the world of inner space. A technologist working for a major manufacturer develops a more compact transducer. A manager makes one of the countless decisions he must make in his job. A union business agent meets with a representative of management to iron out a problem. A production worker completes his shift at a plant.

An appliance repairman fixes a broken-down refrigerator. A truck driver delivers a load of new refrigerators. An iron miner completes his shift on a power shovel. A stock broker sells 500 shares of AT&T. One company goes out on strike; another goes back to work. The cost of living goes up one-tenth of one percent. A computer completes a payroll and, in the next moment, provides an accurate inventory. It's industry as usual. People working, planning, building, shipping, fabricating and mass-producing goods.

When we consider what has not been done, it seems clear that people in industrial arts have a mandate for social and technical action. I offer no panacea. I offer no substitute for whatever plan or organizational system you now use. I offer no alternative for the facilities and equipment you have at your disposal. I ask only that you be an effective teacher. If you are an administrator, this means that you should provide your industrial arts teachers with time to become effective. The absolute essential for social and technical action is you.

Mr. Brown is on the faculty at Chico (California) State College.

What action is necessary to change industrial arts?

Henry S. Paulin

My particular task today is to discuss with you some ideas of "What Action Is Necessary to Change Industrial Arts?" The word action as defined by Webster means that "action is the doing of something." After my second year at San Francisco State College, I have had my baptism of action in the highest degree.

When we think of change, we find change taking place in a variety of areas of our culture. Technology and science are advancing rapidly. We find change in all areas of living and certainly in education. As we look back historically, industrial arts has been in constant change by name. The genesis of industrial arts began with manual training followed by manual arts and currently industrial arts, which concerns itself with the technology. Even the new area of study, industrial technology, has evolved out of industrial arts.

Professionally, we find ourselves involved with an extremely broad definition which fits the category of general education rather than specialization. The objectives of industrial arts are broad and not narrow. This means our area of work concerns itself with a great degree of flexibility rather than rigidity. As professionals, industrial arts teachers are great doers. We are concerned with a variety of technical solutions which affect man's existence in this scientific and technological world. Our entire economy is being shaped by the future of technology. Much of the current literature in our profession concerns itself with providing students with a variety of opportunities to develop their potential in the areas of problem-solving, planning, organizing, creating, fabricating, designing and evaluating their results. Therefore, I believe this profession, which we represent, has unlimited opportunities. Our horizons are extremely broad, and I can go so far as to say our potential has been kept under a bushel basket.

But, what have we done in the form of action to change the nature of our image professionally? We know that we are not very well-understood by the public. When we talk about industrial arts, the public still thinks of our work as manual training, that we are only involved with manipulative skills. According to the recent report by the Arthur D. Little Company, a consultant firm doing work for the State Education Department of California, there is an expanded concept of industrial arts as being mostly a rhetorical exercise that is "between philosophy and promise and action and achievement." A significant gap exists today. In practice, the report maintains that industrial arts generally continues to devote "approximately 80% of class time to shop practice" and only "20% to related instruction, demonstrations, class discussions, investigation and study." The reasons this "appealing philosophy" did not take hold, the report asserts, is that industrial arts received no Federal funds, as vocational education did, and "was not supported with research to develop the innovative curriculum and pedagogy it called for. Moreover, the philosophy of industrial arts called for but did not receive a new kind of teacher training and re-training that industrial arts credentialing programs were not providing."

So we get right down to the crux of the matter: What has industrial arts been doing to effect change? Has it been able to forecast, to predict its future? Curriculum forecasting should be a very important responsibility of the industrial arts profession. We should be able to forecast in order to be current as well as futuristic. New curriculum development must come from within the industrial arts profession.

This means the profession must develop self-study techniques. What kind of an image are we portraying to the public? This certainly must be reflected in the kinds of programs that we provide, from the elementary to the collegiate levels of the educational enterprise.

What are we really concerned with in industrial arts? First of all, we teach people. Even though our subject matter is in the area of technology, I think the more important element that we should be concerned with is to teach students to think, to mature, to grow, to develop, and to give students every opportunity to develop their talents to their maximum potential. This requires a new approach in teaching industrial arts. Can a student develop himself more fully if he is given the chance to search for solutions to problems rather than making a given project that is predetermined by an instructor, or a project which a student may copy from a given magazine, and then go ahead and produce the product?

Do we not have the responsibility, if we say that we truly reflect and interpret the total industry, that our students should be exposed to the total panorama of industry? How about the whole world of work? What should be the relationship of the student's investigation concerning the nature of employment today? If you look in the want ads of the newspapers, the language of technology and industry is certainly beyond what we are doing in our traditionally-oriented programs in industrial arts, such as wood-working, metalworking, electronics, drafting, leathercraft, graphic arts and others. We need to include information on lasers, optics, honeycombs, computers, color theory, environmental simulation, holography and many others. How about this whole area of economics? What should be our responsibility in identifying the gross national product to our given students, the investments that industries make today in order to keep our economy moving? Should they not know about the new emerging industries, such as the new medical technology, oceanography, nuclear energy, learning aids and pollution control?

In the area of teacher education we should definitely look at our profession and analyze where we need to reorient and change our programs. After all, it is the teacher education program that produces the teacher and what he does, and what he learns in the teacher education program is reflected in what occurs at the public school level. How much do we do in our industrial arts programs that will stimulate and charge up our youngsters to major in industrial arts in college? The whole field of recruitment is certainly a major problem for us to consider. It is the environment of an industrial arts facility and the program that will inspire students to become industrial arts teachers. By this, I mean we generally have static-looking facilities. We need to add sales appeal and more bounce. Let us look at the possibilities of updating and sharpening our color scheme. Our laboratories so often are very drab. They do not entice people. They do not stimulate them.

I think we have to look into the whole area of equipment. We have a lot of equipment and gear tied to the floors. It is stationary, permanent, and it does not permit the kind of flexibility that we need in order to really define and interpret the nature of an industrial organization.

We should look into the possibility of developing flexible laboratories, laboratories that will permit mobility, process flow, or new manufacturing techniques. It might behoove us to look at the possibilities of having equipment that is lightweight, small and laboratory-type in order to perform functions of industry. The equipment should be selected and justified on the basis of educational specifications.

Another need, as I see it, is a systems approach for a laboratory environment. I think we are beyond the unitized types of laboratories. If we look at industry, it is not unitized in terms of the types of laboratories that we have across the country. In most schools and colleges our laboratories are segmented. They do not seem to interrelate with each other. We too often deal in separateness, and this kind of separateness reflects a dissociation that I think makes each industrial arts teacher move into his own niche and find his security in this niche.

Basically, what I am saying is we ought to look at the total area of relating our laboratories or learning environment on a systems approach. Industry works with a variety of materials and machines, as well as interrelated departments, such as design, production, engineering, business and all the elements which make an industrial enterprise function. Why should not industrial arts teachers work on an interrelated basis? I see here the potential and the possibility of every teacher contributing his maximum potential. I think we have the brain power, the initiative, the enthusiasm and the know-how to have the most sophisticated type of an operation in the school system today.

In the area of teaching methodology, I think we ought to utilize the technology to teach the technology. By this I mean there are a variety of new devices developed that we could use in our instructional program which would help industrial arts teachers become more efficient. Program textbooks are a recent innovation. These are very suitable to provide students with an opportunity to work and to study materials in a broken-down fashion which are organized step-by-step so that students can learn at their own rate. There are the computer-controlled machines. This material is fed into a computer and stored in the form of cathode ray of an image. We find this in filmstrips, microfilm, or a combination of these. I think we ought to look into the whole audio-visual field of variety of supplemental uses such as microfilms and tape recorders. Tape recorders are especially useful, particularly where students can get together in teams and analyze their work. Research data can be put on tape, and students can review and report their work on a day-by-day basis. We ought to look at the possibility of written response machines. I think answers to particular questions can be worked out so that it speeds up student learning as well as evaluation on the part of the instructor. As we get into this whole area of experiments concerning the field of educational technology, we should look at an important factor, that students proceed to learn at a variety of different rates and each student is able to acquire knowledge at a pace which is comfortable to him.

The one thing we have not done adequately in industrial arts and in education in general, is to understand and learn more about human intelligence. Some experts think slower students may possess more analytical ability than fast students, and the teacher many times does not often recognize the true ability in a student. We have had this example exhibited by the late Albert Einstein, who once received a failing grade in a university mathematics course.

Technically, we ought to look at the potential contributions of educational technology. We need to incorporate as many techniques as we possibly can into our teacher education programs in the area of methodology, in order that industrial arts teachers may better utilize their time. Let us look at the repetitive amount of demonstrations an industrial arts teacher performs in his teaching career. These demonstrations could very well be put on video-tape and replayed on television monitors. We ought to look at the potential here of using video cameras where the demonstration can be taped, and then students would have an opportunity to see the demonstration on a one-to-one ratio. Many times the difficulty is that the student does not see the total demonstration or does not apply what he has seen in the demonstration. Professionally, we should be concerned with improvement of instruction. There is talk about automated types of teaching devices, and the fear of many teachers is that they may replace the teacher. I doubt this very much, because I look at the automated teaching devices as purely supplemental to the educational process.

We have the whole area of retrieval of information that can be built up and stored. I think we have been caught in a situation in industrial arts where the industrial arts teacher thinks he has to know everything to be able to teach. I think more and more we are getting into the area of the industrial arts teacher being a resource person. Technical knowledge is doubling every day. It is impossible for the industrial arts teacher to be up with the latest. We should rely on the latest films and technical devices, and bring in as many possible resources in order to keep our programs current and updated.

A very real concern in industrial arts, of course, is the laboratory facility. This is our base of operation. Here again we are working in an environment which should technically and logically try to reflect industry in the best possible way, but, of course, in order to keep current and to teach current technology, this does not seem to be very feasible and very possible in many of our programs. We are up against the monetary side, where proper funding is not available, but also from the long view, we are concerned with obsolescence. Professionally, we are committed to interpret and translate the technology. But, we are doing this in obsolete laboratories. Yet, many of our laboratories are equipped with surplus equipment. This particular area requires a considerable amount of rethinking.

I suggest we consider a bold new solution for support of industrial arts programs. By this I mean the possibility that we should become partners with private industry and that by relating very closely to private industry, industry could very easily subsidize industrial arts programs. This approach has the possibility, for example, to establish a manufacturing research and development facility. Equipment may be acquired on a lease or loan basis as required by the function. A manufacturing research and development facility is a thinking, searching, creating and inventing atmosphere for better solutions to problems. This does have a certain amount of merit, because we can then develop what I would like to see – an interdisciplinary team in which industrial arts teachers more fully interrelate with experts in industry. This would create an industrial arts-industry interdisciplinary team which has complete involvement in the programming of the industrial arts curriculum to reflect current technology and industrial functions. After all, if we are going to say that we are in the business of interpreting the technology, then industrial arts teachers ought to have the opportunity to expose students to engineers, scientists and business personnel on a direct conversion basis. This technique, as an interdisciplinary systems approach, would provide interactions and feedbacks about new technologies, new knowledge, new imagination and skill. Via this approach, students can pursue the world of work in a more intelligent manner when they are exposed to the requirements and minds of industry.

The usually interdisciplinary methods used in some schools are to involve a variety of disciplines on a team basis. Mathematics and science teachers can assist in solutions to scientific-technical problems. The business department can relate to manufacturing organization structures. The art department can help to develop aesthetic awareness in students.

From the standpoint of counseling, an interdisciplinary team approach has merit in team counseling. This method would give teachers an opportunity to better assess industrial arts students and thereby be able to improve the quality of our students in industrial arts. We need to attract all the students into industrial arts. Our area of work should merit the same consideration along with the other disciplines.

Leisure time is another area to be considered. The latest Merrill Lynch publication indicates that the leisure investment opportunities are in a "150-billion-dollar market." Now you and I know that man needs to do something beyond his average work day. In Webster's New World Dictionary, leisure is defined as "free unoccupied time during which a person may indulge in rest, recreation, and so forth." Now, from our standpoint, I think we need to include in our curriculum the total spectrum of what leisure is all about. We should go beyond our particular curriculum that concerns with the doing side. We have a place in the area of recreation. By the year 2000, we may end up in the business of strictly recreation. Maybe we will still need footstools, tieracks and pump lamps. But let us be realistic. I think our students need to know about the total world of leisure, because it is a very complicated market concerning a variety of industries, such as food, lodging, transportation and related services. Basically, what we ultimately need to do is to have a large portion of the curriculum expose all the students in the schools to the leisure industry and the amount of free time Americans are going to be enjoying in the future. Industry itself, as detailed by Fortune, shows that "21 million American families or 34% of the total had after tax incomes of $10,000 or more last year and in 1959, only 10 million families or 17% of the total were in that income bracket so by 1975, the number of families with more than $10,000 is expected to total 34 million or almost half of all American families." What is actually occurring on the American scene, according to a study by the University of Michigan Survey of Consumer Finances, is that the percentage of people buying products for recreation and hobbies rises with income and so does the size of the expenditure.

In summary, what I have tried to do today is to share with you the potential of our profession. Our area of work does have substance. The technology is here. The technical information is here. The resources are here. Each industrial arts teacher must look into his or her personal soul and see the image that he or she is presenting in the name of the industrial arts profession.

Dr. Paulin is on the faculty at San Francisco (California) State College.

business of the association

Minutes of the Delegate Assembly business meeting

President Delmar W. Olson called the meeting to order at 2:45 p.m., and called for the reading of the minutes of the 1968 Delegate Assembly. Howard S. Decker, executive secretary, read the minutes. William Scarborough moved that the minutes be approved as read. Kenneth Schank seconded the motion, and the motion carried.

President Olson called for the reading of the treasurer's report. Howard S. Decker read the treasurer's report. Sanford Wolff moved that the treasurer's report be approved. Lambert Sailor seconded the motion, and the motion carried.

President Olson called for unfinished business. No old business was brought to the floor.

President Olson called for new business.

Howard S. Decker announced that the ballots had been tabulated regarding the new dues structure and had passed by a mail ballot by about three and one-half to one for the increase in dues.

President Olson called on Ralph C. Bohn, chairman of the Resolutions Committee, to read the resolutions. Dr. Bohn read resolutions 1 through 7 to be treated as a block and moved that same be accepted. This motion was seconded by William Kabakjian, and the motion carried. Dr. Bohn read resolution 8 and moved that same be accepted. This motion was seconded by Willis Wagner and the motion carried. Dr. Bohn read resolutions 9, 10, 12 and 13 and moved that same be accepted. The motion was seconded by Earl Davis, and the motion carried. Dr. Bohn read resolution 11 and moved that same be accepted. The motion was seconded by Kenneth Thomas, and the motion carried. Dr. Bohn read resolution 14 and moved that same be accepted. The motion was seconded by Kenneth Schank, and the motion carried.

President Olson reported to the group on the growth of the organization.

President Olson introduced Dr. Kenneth R. Seifer, who congratulated the AIAA for its fine convention and the excellent teacher recognition program.

Mr. Sherwin Powell introduced the teacher awards committee members and thanked them for another job well done. He also expressed his appreciation to the state representatives and state associations, who helped to make the teacher recognition program possible. The outstanding teacher awards were presented by Mr. Powell.

The meeting was adjourned at 4:00 p.m.

Respectfully submitted,
O. Frank Haynes, Recorder

Teacher Recognition Committee report

Sherwin D. Powell

Members of the Committee:

William Landon	- Englewood High School Englewood, Colorado (Term expires 1969)
Jacqueline Killam	- El Rodeo School Beverly Hills, California (Term expires 1970)
Russell Amling	- Minnesota State Teachers College Mankato, Minnesota (Term expires 1971)
Dennis W. Harley	- Lorne Hazelton School Saskatoon, Saskatchewan, Canada (Term expires 1971)

Frank N. Kanzaki - Department of Education
Honolulu, Hawaii
(Term expires 1971)

William Wilkinson - Nether Providence School District
Wallingford, Pennsylvania
(Term expires 1971)

AIAA State Representatives, State Association Officers, and State Teacher Recognition Committee Chairmen are considered members of this committee and have cooperated to make this program a success.

The number of teachers receiving awards since the beginning of the program are:

1963 --- 21 teachers
1964 --- 30 teachers
1965 --- 30 teachers
1966 --- 39 teachers
1967 --- 44 teachers
1968 --- 51 teachers
1969 --- 54 teachers

This year all 50 states are participating in The Teacher Recognition Committee Program. Ontario and Saskatchewan (two Provinces of Canada) and Guam and Puerto Rico are also participating.

All recipients of the AIAA program will receive a brass engraved plaque mounted on wood, and a framed certificate.

For the first time this committee has mailed press release notices to all newspapers prior to convention time. This was done to relieve our staff secretaries of the extra time involved in preparing this report, thereby giving them more time for necessary convention duties.

The Teacher Recognition Committee wishes to give thanks to the members in all states who have contributed so much time and effort in making this year's program a 100% participation.

As Chairman, I wish to thank the members of this committee for their individual contributions; without their leadership and assistance, the work of this committee could not have been accomplished.

Assistance from outside this committee should also be recognized.

I wish to thank Dr. Ralph Bohn and his staff for printing the certificates to be awarded for the first time this year. Many thanks to Dr. Robert Woodward for securing the frames for the certificates.

The Teacher Recognition Committee wishes to thank the AIAA Executive Board and the "SHIP" for their continued encouragement and financial support of this program. We feel that this is our most important public relations program.

Following are the names of this year's outstanding teachers:

ALABAMA - Joan A. Fisher, Alabama Industrial Arts Association; ALASKA - Jerry L. Byler, Alaska Industrial Arts Association; ARIZONA - Robert Ronald Witt, Arizona Industrial Education Association; ARKANSAS - Alfred A. Culpepper, Arkansas Industrial Arts Association; CALIFORNIA - Wade M. Anderson, California Industrial Education Association; CANADA, ONTARIO - E. Bruce Slater, Ontario Industrial Arts Association; CANADA, SASKATCHEWAN - Dennis W. Harley, Saskatchewan Industrial Education Association; COLORADO - Leslie P. Litherland, Colorado Industrial Arts Association; CONNECTICUT - Carl H. Hubachek, Connecticut Industrial Arts Association; DELAWARE - Howard W. Smith, Delaware Industrial Arts Association; DISTRICT OF COLUMBIA - Joseph G. Brown, Jr., District of Columbia I.A. Teacher Association; FLORIDA - Howard B. Vaughn, Florida Industrial Arts Association; GEORGIA - James W. Bray, Georgia Industrial Arts Association; GUAM - Neil A. Mack, Guam Industrial Education Association; HAWAII - George Nishimura, Hawaii Industrial Arts Association; IDAHO - Jerry Holes, Idaho State Industrial Education Association; ILLINOIS - Van Eugene Craig, Illinois Industrial Education Association; INDIANA - Michael C. Barrett, Indiana Industrial Education Association; IOWA - Donald R. Darrow, Iowa Industrial Education Association; KANSAS - Ralph O. Johnston, Kansas Industrial Education Association; KENTUCKY - Chad Middleton, Jr., Kentucky Industrial Education Association; LOUISIANA - Rudy Lange, Louisiana Industrial Arts Association; MAINE - Linwood A. Abbott, Maine Industrial Arts Association; MARYLAND - John T. Bruehl, Jr., Maryland Industrial Arts Association; MASSA-

CHUSETTS - James F. O'Sullivan, Massachusetts Industrial Arts Association; MICHIGAN - Harold I. Vargason, Michigan Industrial Education Society; MINNESOTA - Quentin C. Wood, Minnesota Industrial Arts Association; MISSISSIPPI - George H. Carter, Mississippi Industrial Arts Association; MISSOURI - R. Milton Cochran, Missouri Industrial Arts Association; MONTANA - Bruce S. King, Montana Industrial Arts Association; NEBRASKA - Glen E. Marshall, Nebraska Industrial Arts Association; NEVADA - Grant J. Holdsworth, Nevada Industrial Arts Association; NEW HAMPSHIRE - Robert S. Holt, New Hampshire Industrial Education Association; NEW JERSEY - Richard F. Hornchek, New Jersey Industrial Arts Association; NEW MEXICO - Spencer Gilliland, New Mexico Industrial Arts Association; NEW YORK - Donald Pitkoff, New York State Industrial Arts Association; NORTH CAROLINA - Claude R. Edwards, North Carolina Industrial Arts Association; NORTH DAKOTA - Lawrence E. Sheppard, North Dakota Industrial Arts Association; OHIO - Walter S. Petry, Ohio Industrial Arts Association; OKLAHOMA - Clifford R. Moon, Oklahoma Industrial Arts Association; OREGON - John Riley, Oregon Industrial Arts Association; PENNSYLVANIA - Richard A. Long, Pennsylvania Industrial Arts Association; PUERTO RICO - Jaime A. Espada Reyes, Puerto Rico Industrial Arts Association; RHODE ISLAND - George M. Peters, Rhode Island Vocational and I.A. Association; SOUTH CAROLINA - Hugo C. Aldrich, Sr., South Carolina Industrial Arts Association; SOUTH DAKOTA - Edward J. Charboneau, South Dakota Industrial Education Association; TENNESSEE - James R. Crawford, Tennessee Industrial Arts Association; TEXAS - Neil E. Ballard, Texas Industrial Arts Association; UTAH - Gordon E. Mickelsen, Utah Industrial Arts Association; VERMONT - Robert L. Morse, Vermont Industrial Arts Teachers Association; VIRGINIA - Edgar Thacker, Virginia Industrial Arts Association; WASHINGTON - Wendell K. Allen, Washington Industrial Arts Association; WEST VIRGINIA - Woodford C. Cecil, West Virginia Industrial Arts Association; WISCONSIN - James S. Mau, Wisconsin Industrial Arts Association; WYOMING - Jerry W. Heath, Wyoming Industrial Arts Association.

Mr. Powell is chairman of the Teacher Recognition Committee.

Resolutions approved by the Delegate Assembly

Annually, members of the AIAA express their opinions in the form of resolutions, which become a part of the program for the coming year as well as credit past achievements. Here are this year's resolutions:

1. Appreciation to the President.

WHEREAS, Delmar W. Olson has given unstintingly of his time and has provided capable and intelligent leadership as president of The American Industrial Arts Association, and

WHEREAS, The American Industrial Arts Association has made notable progress under his direction,

THEREFORE BE IT RESOLVED that the officers, the executive board and the members of The American Industrial Arts Association express sincere appreciation for his outstanding service as president of The American Industrial Arts Association during the year 1968-69.

2. Appreciation to the Convention Committee and Program Committee and Program and Convention Participants.

WHEREAS, many members of The American Industrial Arts Association have given many hours of faithful service in making the effective plans and excellent preparations for the Thirty-first Annual Convention, and

WHEREAS, innumerable responsibilities were willingly accepted and capably completed by many persons working for a successful convention, and

WHEREAS, a cordial environment, cooperative spirit and friendly atmosphere characterized the convention,

THEREFORE BE IT RESOLVED that sincere appreciation be expressed to Fred Baer, general chairman; Walter Burdette, program chairman; George Ditlow, convention director; to all members of the convention committees; and to all of the industrial arts students, teachers, supervisors and teacher educators, as well as to industrial arts student club members, whose generous contribution of time and effort insured the success of this convention.

3. Appreciation to the SHIP.

WHEREAS, the continued support and assistance of the SHIP is a significant factor in the conduct of the annual convention of The American Industrial Arts Association, and

WHEREAS, the commercial exhibits do contribute in large measure to the spirit and substance of the convention,

THEREFORE BE IT RESOLVED that the members of The American Industrial Arts Association express their sincere appreciation to Daniel W. Irvin, president, and George Bamberger, vice-president, of the Educational Exhibitors Association, and to Deck Officer Edward Bellezzo and his crew, and to all the commercial exhibitors for their participation in the 1969 convention.

4. Appreciation for the Teacher Recognition Program.

WHEREAS, The American Industrial Arts Association is pledged to encourage and recognize excellence in teaching, and

WHEREAS, the program for the recognition of outstanding industrial arts teachers has come to be one of the highlights of the convention program,

THEREFORE BE IT RESOLVED that expressions of appreciation and commendation be given to Vice-president Sherwin D. Powell and his committee for the excellent conduct and continued promotion of this program.

BE IT FURTHER RESOLVED that expressions of appreciation and commendation be forwarded to the officers and members of the state associations who have participated in this program.

BE IT FURTHER RESOLVED that the officers and members of The American Industrial Arts Association express sincere gratitude to the SHIP organization for its continued financial support of this program to recognize outstanding classroom teachers.

5. Appreciation to the Executive Secretary.

WHEREAS, the effective functioning of the National office is a vital factor in the promotion and improvement of industrial arts education, and

WHEREAS, the coordination and administration of all phases of the program and services of The American Industrial Arts Association are the responsibility of the executive secretary and his staff,

THEREFORE BE IT RESOLVED that the officers and members of The American Industrial Arts Association express their sincere appreciation to Howard S. Decker for the very capable and efficient manner in which he has performed the duties of the executive secretary-treasurer of The American Industrial Arts Association.

6. Appreciation to Clark County Public Schools.

WHEREAS, the success of the convention was insured through the wholehearted cooperation of the Clark County Public Schools, and James I. Mason, superintendent, and

WHEREAS, the school system provided valuable support in personnel, equipment and facilities,

THEREFORE BE IT RESOLVED that the officers and members of The American Industrial Arts Association express sincere gratitude to the Board of Education and the administrative staff of the Clark County Public Schools.

7. Appreciation to the Governor.

WHEREAS, the governor of the State of Nevada has shown interest in and concern for industrial arts education by proclaiming the week of April 6-12, 1969, as Industrial Arts Week in Nevada,

THEREFORE BE IT RESOLVED that the officers and members of The American Industrial Arts Association express sincere gratitude to Governor Paul Laxalt for this proclamation.

8. New Affiliate of The American Industrial Arts Association.

WHEREAS, American Industrial Arts Association affiliates aid significantly in furthering the program of The American Industrial Arts Association and in carrying the program to the membership, and

WHEREAS, association affiliate's petition for membership on a voluntary basis is an affirmation of interest and support for the program of The American Industrial Arts Association,

THEREFORE BE IT RESOLVED that affiliation membership be approved for the Wyoming Industrial Arts Association, and its officers and members be commended for their efforts leading to this request

9. State Supervision of Industrial Arts.

WHEREAS, industry and technology have become the dominant element in American economic life, and

WHEREAS, industrial arts is the area of education concerned with the interpretation and understanding of industry, and

WHEREAS, many new educational techniques and media have become available, necessitating improved educational communications, and

WHEREAS, leadership at the state level is essential to the growth and development of sound industrial arts programs in the public schools, and

WHEREAS, state leadership is available in 33 of the 50 states, and there is need for the extension of this service, and

WHEREAS, those states with professional leadership in industrial arts in the state department of education tend to have better programs of industrial arts and serve more youth,

THEREFORE BE IT RESOLVED that The American Industrial Arts Association request Congress to support legislation that will provide the necessary leadership and ancillary services in industrial arts in all states, and

BE IT FURTHER RESOLVED that The American Industrial Arts Association seek the support of all interested groups and organizations in the enactment of this needed legislation.

10. Appropriation of Funds for NDEA Title III.

WHEREAS, Title III of the National Defense Education Act has provided funds for the purchase of equipment and instructional materials for the continued improvement of instruction in industrial arts in our nation, and

WHEREAS, the budget prepared by the outgoing administration in Washington has recommended that no funds be provided for Title III of NDEA,

BE IT RESOLVED that The American Industrial Arts Association recommend that the Congress of the United States appropriate the full authorization for this Act, a total of 120 million dollars for the coming fiscal year.

11. Curriculum Development and Supervision.

WHEREAS, Title III of the National Defense Education Act has significantly assisted in the improvement of instruction in the critical subjects listed in the Act, including industrial Arts, and

WHEREAS, further instructional improvement can be achieved through curriculum development in and supervision of the critical subjects by local educational agencies,

BE IT RESOLVED that the officers and members of The American Industrial Arts Association request that the Congress of the United States amend Title III of the National Defense Education Act to provide funds to local educational agencies for curriculum development and supervision.

12. College Equipment and Remodeling.

WHEREAS, Title VI of the Higher Education Act has significantly assisted collegiate programs with funds for the purchase of equipment and necessary remodeling, and

WHEREAS, collegiate industrial arts departments have experienced significant support for their programs with funds from this Act, and

WHEREAS, the budget prepared by the outgoing administration in Washington has recommended only partial funding for Title VI of the Higher Education Act,

BE IT RESOLVED that The American Industrial Arts Association recommend that the Congress of the United States appropriate the full authorization for this Act.

13. Support for the Canadian Industrial Arts Association.

WHEREAS, the Canadian Industrial Arts Association (CIAA) is making a major effort to gain members from all provinces of Canada, thereby becoming representative of industrial arts in Canada, and

WHEREAS, they are hoping to have their first national convention during the summer of 1970,

THEREFORE BE IT RESOLVED that The American Industrial Arts Association support and encourage the development of a strong and active Canadian Industrial Arts Association to strengthen industrial arts instruction in Canada, and

BE IT FURTHER RESOLVED that The American Industrial Arts Association encourage this development by providing assistance through our Canadian and International Vice-president, and cooperate in the establishment of mutually beneficial liaison between the Canadian Industrial Arts Association and The American Industrial Arts Association.

14. Support for the Formation of High School Clubs.

WHEREAS, The American Industrial Arts Association has a well-planned and -developed high school industrial arts club program, and

WHEREAS, Bobby Tillman, an officer of the American Industrial Arts Student Association, emphasized the positive values of club membership during his excellent presentation at the first general session of this convention,

BE IT RESOLVED that The American Industrial Arts Association encourage all industrial arts secondary school teachers to organize and develop student clubs in their schools, and

BE IT FURTHER RESOLVED that each state association president appoint a state coordinator for high school industrial arts clubs, with the full support and encouragement of The American Industrial Arts Association.

The President's Report, 1968-69

Delmar W. Olson

The present year, 1968-69, has been a period of increased activity and achievement for The American Industrial Arts Association. Because it has, I have been especially happy to have been involved as its president. It is not that I have contributed significantly to either action or achievement, since many of the latter have been in planning and development for longer than the year. Rather, it is because I have been able to catch on to some of the excitement that accompanies the very process of action and achievement. In my opinion The Association is in excellent health; it is growing in membership, and in the types and quality of its services to the profession. But more than this, it is reflecting the increasing vigor of industrial arts education throughout the country and is making distinct contributions to increasing this vitality.

May I summarize some of the achievements which to me especially point to the health and vigor of The Association.

The Membership. When the membership goal of "double the membership" was accepted three years ago, many of us no doubt felt it to be overly ambitious. However, as we move into the last lap of the campaign, it now appears that, come July 1, 1970, we shall have reached this goal. This does not mean that we can coast in this final lap; rather it means that with the continuing efforts of our membership chairmen, national and state, plus the assistance of each individual member in encouraging his immediate colleagues to membership, it is entirely possible to reach this goal. Personally, I feel that it is not only possible but probable. My optimism stems from the evidences of professional vitality I sense among our ranks today. As of January 1 our total membership was just under 10,000 in all categories, and at the close of the Las Vegas convention we will undoubtedly have passed this figure.

The New Executive Secretary-Treasurer. With Howard Decker's announcement of his intention to return to the university community as of the fall of 1969, a selection committee for his successor went immediately to work. The invitation to our membership to make nominations brought the names of 44 men. Of this group 22 declined their nominations, leaving a like number as candidates. After some months of deliberation, four were invited to the Washington office for interviews with the committee. The person chosen was Dr. Edward Kabakjian, associate professor of industrial arts, Trenton State (NJ) College.

Dr. Kabakjian will assume office at the August meeting of the executive board and prior to this will spend two weeks with Dr. Decker in Washington to effect a smooth and orderly change of leadership.

The committee was impressed by the fact that 22 of its colleagues from across the nation were interested in the position, as well as by their qualifications. This fact in itself reflects the vitality of the Association and the profession.

Balloting for New Officers. You will be interested in knowing that twice as many ballots were mailed this spring for the election of president-elect and vice-president for classroom teachers as were sent out for the same purpose in 1966-67. This fact, too, reflects the growth of the Association.

The AIAA-Appalachian State University Institute. The five one-week institutes for officers of state industrial arts associations held during 1968 were felt to be so successful as to warrant their continuation. On Saturday afternoon and Sunday morning following the Las Vegas convention, a follow-up conference will be held. The Association will submit a substantial proposal for an Education Professions Development Act grant to conduct leadership training workshops cooperatively with its affiliated state associations during fiscal year 1971.

The Washington Symposium. The Washington Symposium on leadership in industrial arts education was held August 17-18 in the NEA building. It was a work conference for the development and expression of positions on major problems and issues facing the profession. More than 100 persons were involved, and from this, eight 16mm color films and four discussion tapes were produced. The latter are currently being rented and purchased by industrial arts departments in schools and colleges. Much of the cost of the Symposium was underwritten by the Power Tool Division of the Rockwell Manufacturing Company, Pittsburgh.

Executive Board Enlargement. During this past year, the membership of our executive board has been increased to include the second vice-president for classroom teachers, reflecting the increasing association memberships from this group. The formation of the American Council of Industrial Arts State Association Officers (ACIASAO) was finalized. A constitutional change authorizing the affiliation will be voted on this fall. If approved, a vice-president for the new council will be added to the board.

Commission for Policy Statement. The Special AIAA Commission for Policy Statement on the Relationship of Industrial Arts to Other Programs of Education submitted a comprehensive report of its study. The excellence of the report done under the chairmanship of Theodore E. Guth is such that the Committee is being asked to extend its study. I personally wish to commend this committee for its productivity and urge it to continue its work.

CONPASS. The AIAA is now included and represented in the Consortium of Professional Associations for Study of Special Teacher Improvement Programs, which means that this group has accepted industrial arts education as a discipline. In a sense this indicated a degree of "arrival" for the profession. We are now accepted, along with the academic subjects of mathematics, science, English and others, as having a body of knowledge to represent. The group will meet in June, to which some AIAA members will be invited. Ralph Bohn and Howard Decker are the association representatives.

AIAA-NEA Affiliation. As a result of organizational revision within the National Education Association permitting different types of affiliation for national professional associations such as ours, the executive board in session at Las Vegas voted to change its status from that of department to national affiliate. The change involves essentially a change in accounting procedures involving tax status, social security, payrolls and unemployment compensations, for which our office now assumes full responsibility. The change in status to that of national affiliate effects a savings over that of a department. The normal services of the NEA are available to the AIAA as before the change.

Outstanding Teacher Awards. For the first time in its history the Committee for Teacher Recognition, under the chairmanship of Sherwin D. Powell, is able to report 100% of state nominations. Each of the 50 states has this year named its outstanding teacher, all of which were recognized and presented plaques at Las Vegas. In addition Canada, Guam and Puerto Rico submitted their nominations. Here is another sign of the dynamism within the Association.

The Office Staff. During the year it has been my pleasure to meet each of our office staff and to see them at work. The efficiency and enthusiasm with which they perform is a pleasure to watch. May I introduce this team to you:

Advertising Manager, The Journal - Minnie Warburton
Membership Secretary - Florence Lee
Bookkeeper, Office Manager - Mary E. McKeaver
Secretary to Dr. Decker - Donna J. Martin
Student Club Coordinator - Minnie Warburton
Managing Editor, The Journal - Linda A. Taxis

The productivity of this staff is another indication of the health and vigor of the Association.

The Journal of Industrial Arts Education. Effective September 1970, The Journal will be published monthly during the academic year. The acceptance of The Journal by our membership and the reception it has received by other professional groups indicates the tremendous prestige it has achieved in its relatively young life. I am sure that each of you is as proud of each issue as I. The overwhelming acceptance of the membership dues increase (4 to 1) makes possible the monthly issues. Any professional group is judged by its journal. I know that ours is doing very well for us.

The 1969-70 Convention at Louisville. Planning for the AIAA Convention in Louisville next year has been in progress for several months under the leadership of James H. Disney, general chairman, and Joseph A. Schad, program chairman, along with C. Dale Lemons, program co-chairman.

The efficiency and dispatch with which teams of our own men dream up, develop and manage our national conventions is nothing less than amazing to me, especially since none of them is a professional in these matters. Even now the Florida group with Ralph Steeb has already begun the planning for the 1971 convention at Miami Beach.

Your Present President. Speaking for myself, I have never known a busier year nor a more rewarding one. This, of course, is not due only to the experience of the presidency. Other responsibilities have had to be carried out as well. My only regret is that I wasn't more efficient in the management of my time so that I could have accepted more invitations to visit state industrial arts conventions and universities. Wherever I did visit – Minnesota, Wisconsin, Indiana, Ohio, Massachusetts, New Jersey, South Carolina, Tennessee, Florida, Mississippi and others – I found a similarity of professional concerns focused largely on curriculum and on the possibility of engulfment of industrial arts education by vocational education. We all seem to be asking about what's new in curriculum, and great numbers are wondering about the threatened inroads of vocational education under the 1968 Federal act. The two concerns are being brought into close relationship by many of our teachers, as they propose that the best answer to the problem of vocational education lies in the development and implementation of a fresh new viable curriculum for industrial arts education. At any rate, it is my opinion that the Association must maintain, extend and strengthen its Washington contacts with educational and political groups. It must take a stand whenever necessary in defense of education for all boys and girls in today's schools as is provided by industrial arts. Any group calling itself a profession has its first responsibility to the betterment of humanity.

While we seek to increase our ranks through membership and place a major emphasis upon it, we must ask ourselves if this is the real goal of this association. With our growth in size, maturity and wisdom, we have accumulated a store of energy which must be converted to power to be useful. In my opinion we are qualified to make our presence known at the national level in our over-all concern and dedication to the boys and girls in the American school. But we must also be ready and willing; to be capable is not enough. The problems being faced by our teachers and supervisors, as a Federal machine apparently prepares to bulldoze its way into the American school laying waste to industrial arts programs representing more than a half-century of local community-state educational enterprise and serving five million boys and girls per year, are of such nature and dimension that a local teacher and even his state supervisor are unable to solve them. In my opinion our Association has the responsibility to face up to and to come to grips with such issues if it will truly serve the profession and assure that American boys and girls are not to become the pawns in a political power play.

Yet each of us has the power of the pen if he will suggest that his Congressmen take a good look at what is going on, supposedly with their approval.

Together you, I individually, and then collectively through our association may be able to prevent history from repeating itself, as in the Twenties, with Smith-Hughes monies, vocational education all but obliterated us. We came back strong but it took a generation in time. I call on each of you now to stand up and be counted. Five thousand letters to US Congressmen would indeed cause a re-thinking of the course as well as the course.

Our theme for this convention is "Where the Action Is." Let us accept this and now trigger it so that boys and girls can be assured of an increasingly greater and finer opportunity to discover, develop, release and realize their own talent-potentials within the technological culture through industrial arts.

To have the privilege of serving industrial arts by means of the presidency-elect, and then the presidency, has been more pleasurable than I can describe. Just to work with fully-dedicated people as we have in our Association and its divisional groups has been inspiring. To sense the dynamics of industrial arts education on the national scene from the vantage point of the presidency has been revealing. To know that industrial arts is becoming increasingly prestigious through the work of its national association is most gratifying, especially since each of us as teachers have at times felt that he was fighting a losing battle on this front.

My personal appreciation goes out to our executive secretary-treasurer of the past three years, Dr. Howard S. Decker, who with his particular qualities of leadership, organization and management has brought the Association through the greatest period of development and progress in its three decades-plus. I know I can express the feelings of appreciation of the membership for Howard's assistance. The Association as I earlier indicated is in a healthy, vigorous state ready for increased service to industrial arts education. This it will provide under the administration of its new executive secretary-treasurer, Edward Kabakjian. Let each of us now give him our fullest support and cooperation so that through our associated efforts we can hasten the arrival of the Golden Age for industrial arts, which is definitely on its way to reality.

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